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POPULAR SCIENCE

Sept. 35¢ MONTHLY

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Mechanics and Handicraft
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September, 1954

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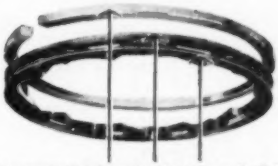

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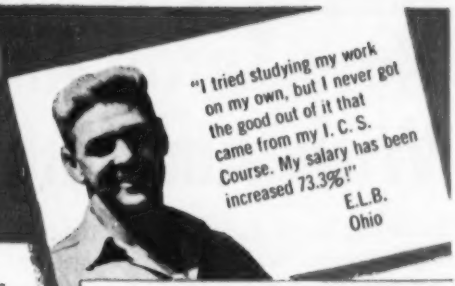
not at all, scientists say



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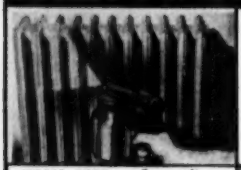

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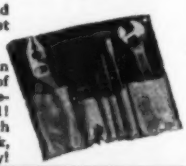

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They found that fish have different sensory reactions. They discovered that most had poor eyesight, that some were almost blind. No wonder they could swim close by the most attractive dry lures without even **NOTICING** them! Nature, in her bounty, had provided fish with a phenomenal sense-instinct that leads them irresistibly to their food supply, so called—**"SMELL-TASTE"**. This strange fish instinct, that of **SMELLING** and **TASTING** at the same time, exists only amongst sea creatures.

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LURENE is different from chemical smell products. Its source is the sea itself. It's the result of study and experiment, test after test and tabulations. "Formula K-873" gave the most startling results—giving up to 53 times more "**SMELL-TASTE**" attraction power than other products. Dubbed **"LURENE"**, it's now available to you. At last you too can get better 'fishing luck''. So easy, quick, convenient!

PROVE IT YOURSELF WITH THIS TEST!

No elaborate equipment required! An ordinary glass aquarium tank and ANY species of fish will prove this new method really works! Drop in two or three hooks with your favorite bait. Treat only ONE with the new LURENE "smell-taste" preparation. It's the same bait . . . the same lures . . . yet right there, before your eyes you'll be witnessing a fascinating spectacle! You'll hardly believe your eyes. The fish, as if compelled by a supernatural power are drawn to the Lurene-treated hook. This article explains how this smell-taste instinct in fish can increase your fishing luck.

Just dab on your bait. Fish as before—with this **BIG** difference: **YOU CATCH MORE FISH** time after time!

FISHERMEN GET AMAZING RESULTS!

Altho **LURENE** is so new, already over 25,000 men have used it for all types of fishing in lakes, rivers, brooks, and on the ocean. One delighted fisherman tells another. They're ordering and reordering. To satisfy the pent-up demand, we are expanding facilities to produce over a million bottles for the **FIRST** year! You'll be amazed too after you've tried **LURENE**!

USE SAME BAIT, SAME TACKLE WITH LURENE

No special techniques. You use the same tackle, dry lures, bait. Dab on bait. It's that simple. Fish as usual for trout, pickerel, bluefish, weakfish, pike, perch, bass, snappers or porgies!

RESULTS GUARANTEED OR LURENE DOESN'T COST 1¢

Try **LURENE** at our risk. **LURENE** goes to work for you in minutes, releasing its **SMELL-TASTE** "call" into the surrounding waters. **SEE** for yourself with **RESULTS**—how this mysterious sea instinct helps draw fish. Prove to yourself that **LURENE** really and truly **WORKS**. All we ask is that you **TRY** Lurene. If it doesn't help fill your creel . . . if you don't pull in more of your favorites—big and small, simply **TELL** us and get your money back — no questions asked. Compare the results with your fishing companions. When their eyes bulge with disbelief, when they ask **HOW** you do it—tell them about **LURENE**. That's the way we're building up **LURENE'S** reputation—on **RESULTS**, real, honest-to-goodness **RESULTS**! Lurene is not yet sold in stores. A 1.98 package is enough to **"SMELL-TASTE"** condition hundreds of live or dry bait. Get your supply by mail now, from the exclusive U. S. & Canada distributors. Rush coupon now to:

CONSUMERS MART
Dept. 7-K-10
352 Fourth Ave, New York 10, N.Y.

Also available in Canada from: CONSUMERS MART, Dept. 7-K-10, 45 St. James Street, West, Montreal 1, P.Q. (Same Price, Same Guarantee. Shipped direct from Montreal.)

CONSUMERS MART, Dept. 7-K-10
352 Fourth Avenue, 7th Floor, New York 10, N.Y.

RUSH.....**1.98** packages of **LURENE**, on **5 DAY FREE TRIAL.** It is guaranteed. The smell-taste formula must help me catch more fish. It must give me thrilling results. Otherwise you will refund my 1.98—no questions asked.

☐ 1.98 enclosed—rush prepaid.
☐ Send COD plus postage.

Name.....
Address.....
Town.....Zone.....State.....

☐ **SPECIAL OFFER: SAVE $1.00** by ordering **two** packages for only **$2.98**. Send check, cash or m.o. on this offer as we cannot ship COD at this special price.

Amazing Offer for POPULAR SCIENCE Readers!

9X AREA MAGNIFICATION!

This is what you see with the naked eye

This is what you see with the POWERHOUSE

Genuine COATED LENSES

FREE OF EXTRA COST

FINE LEATHER CASE

This magnificent case is truly an achievement of the leather-crafter's art. Made entirely of Supple-Soft genuine leather. Beautifully finished in a golden tan with harmonizing stitching and snap closure. Protects your **POWERHOUSE** Binoculars against rain, dust, grime. Yours **ABSOLUTELY FREE** of extra cost with your order for the new **POWERHOUSE** Binoculars with coated lenses!

SAVE $7.00 DIRECT FROM IMPORTER TO YOU

4.98 WITH LEATHER CASE F.T.I.

SEE UP TO TWENTY MILES AWAY!

Lifetime bargain for readers of Popular Science! **THORESEN**—world's greatest importer of German binoculars—brings you famous, nationally advertised **POWERHOUSE** Binoculars at an unbelievably low price! **NOT** another crude Jap model! **NOT** a toy! **NOT** 4 . . . 5 . . . 7 . . . but **9X AREA MAGNIFICATION!** It's the pride and joy of every red blooded sports enthusiast! Thoresen and only Thoresen brings it direct to you for a mere **4.98.**

TRIUMPH OF GERMAN OPTICAL INDUSTRY

The **POWERHOUSE** is made in Western Germany—world's outstanding producers of quality optics—the finest Cameras, Telescopes, Microscopes and Binoculars. German know-how and superb workmanship are reflected in the many features of the famous **POWERHOUSE.** Here are a few: 1. Great Structural Strength without tiring weight. Only 9½ ounces in all! 2. Aluminum centre-post focusing gives you over 25 steady positions for sharp viewing. 3. Easy adjustment for close-apart or far-apart eyes. 4. Crisp, modern design gives you easy, firm grip. 5. New streamlined model as illustrated in reduced size above. 6. Jumbo center wheel gives effortless focusing. 7. High luminosity gives you viewing even in moonlight.

Coated, Precision-Ground Lenses for Superb Viewing

The powerful lenses are the crowning achievement of the 99 year old firm. Far different, indeed, from the moulded plastic kind stamped out by the million. Each and every lens is ground and polished to high tolerances, then skillfully COATED! This takes much longer, costs 20 to 30 times more! But it's worth it! You get **CRYSTAL-CLEAR** viewing. Your eyes don't suffer the strain of excessive distortion and ghost images so common in cheap binoculars. Were you to spend $25.00, we could not give you better quality lenses!

Magic of American Dollar Makes This Value Possible

In less than 18 months **THORESEN** has sold close to 500,000 binoculars—making it the greatest importer of German binoculars in the world! This immense volume, plus the magic of the American dollar, enables us to buy at far less—sell for less! Get your **POWERHOUSE** now at our low introductory price of **4.98,** tax paid, including handsome leather case.

SEEING IS BELIEVING! Try Powerhouse at OUR risk!

One look thru the **POWERHOUSE** will convince you of its superb quality. That's why we want to send one to you on **FREE TRIAL** for 5 days. Use it on hunting or fishing trips. Use it at races—on trips—for bird watching. Always have a ringside seat at boxing matches! Then—if you don't think this is the **GREATEST** binocular value of the last 10 years, return it for full refund—no questions asked!

LIMITED OFFER! Order at once

Only about 100,000 **POWERHOUSES** can be produced this year, due to the high manufacturing standards. To be fair to all, we are forced to place a limit of **ONE** binocular per reader. Send coupon today to ensure yours!

THORESEN'S
352 Fourth Avenue, Dept. 7-K-6, New York 10, N. Y. CANADIANS: Order direct from our Montreal plant: THORESEN CO., 45 St. James St., West, Dept. 7-K-6, Montreal 1, Que. Same price and guarantee. (No extra for Tariff.)

THORESEN'S, Dept. 7-K-6
352 Fourth Avenue, New York 10, N.Y.

RUSH 1 POWERHOUSE with leather case for 4.98, on 5 Day FREE Trial—Money Back Guarantee.

☐ 4.98 enclosed. Send all charges prepaid.

☐ Send C. O. D. plus postal charges

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Town _____ State _____

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The heart of your car's cooling system is the pump that circulates the water. Completely enclosed, your pump never derives benefit from the lubrication applied regularly to other parts of the car, yet it operates continuously while the engine is running.

Permatex Water Pump Lubricant provides the internal lubrication that every water pump should have. It mixes perfectly with cooling system water and anti-freeze to thoroughly penetrate the moving parts of the pump. It prolongs pump life—prevents wear and squeaking. Contains Anti-Rust to keep the radiator water supply crystal clear. Prevents rust for entire season.

Install one can of Permatex Water Pump Lubricant now. Available at garages and service stations everywhere. The distinctive Permatex label has been a guarantee of quality for over 45 years. Permatex Company, Inc., Brooklyn 35, N. Y

PERMATEX
Water Pump Lubricant and Radiator Anti-Rust

Over Fifty Chemical Products for Better Automotive Maintenance

Letters—

I'd Like to See Them *Not* Make . . .

In principle, of course, I'm all for the great American tradition of forever inventing wondrous new devices to make life increasingly softer and more fun. So I'm glad to see you encouraging this habit by printing such features as "New Ideas from the Inventors" and "I'd Like to See Them Make."

But there is one pestiferous gadget that I wish had never been invented—and that's the automobile radio. As a source of squabbles between ma, pa and the kids over what to tune in on a long trip, this ingenious annoyance has marred more potentially pleasant motor jaunts for our family than anything since we got the pup car-trained.

WILLARD WATKINS, Homer, Nebr.

Would other PSM readers like to nominate their least favorite inventions?

American vs. British Cars

Postmen coming to POPULAR SCIENCE MONTHLY'S *offices have been trudging under the extra-heavy load of letters elicited by Laurence Pomeroy's July article, "A Britisher Tees Off on American Cars." The editors wish to thank readers for this outpouring of opinion; next month, a selection of these letters will be published.*

An Earlier Rotary-Wing Kite

I read with great interest your article "He Rides a Kite" [July, p. 98]. I have been involved in rotary-wing aircraft development work with the Air Force for the past 11 years and . . . would like to point out that during 1941 and 1942 Mr. Raoul Hafner of England developed and flew a machine of very similar design to Mr. Bensen's. Mr. Hafner is now in charge of helicopter

An Elephant Goes to School!

IT TAKES years to educate an elephant—but it never forgets. It is this *inborn quality* that makes it unbeatable for heavy work in the jungle. And it is the *inborn qualities* in Macmillan Oil, further improved by an exclusive refining process, that make it unbeatable for top performance in your car.

It's the Nature of the Beast...
It's the Nature of the Oil!

Got a Ping Problem?

Hydraulic Valve Lifters Sticking in Your Car?

Macmillan RING-FREE Xtra Heavy Duty Oil not only reduces wear, but cuts engine ping to a minimum and prevents sticking of valves and hydraulic lifters.

This remarkable oil really whips the problems of today's higher compression engines—yet you still pay only 45¢ a quart.

These are the facts—backed by Macmillan with a money-back guarantee.

How can Macmillan make such an unconditional guarantee? Here's the reason: Macmillan crude oil is selected from only one special area, where the crude has these three great inborn qualities:

1. Greater Natural Detergency
2. Higher Film Strength
3. Less Carbon Formation

All modern oils contain additives; and the Macmillan RING-FREE Xtra Heavy Duty Oil you buy already has special additives in just the right proportion to suit the qualities of the oil.

Remember, the significant fact about Macmillan is that it does not rely on additives alone, as their effectiveness decreases with use. But with the great *inborn qualities* of Macmillan you get better lubrication than with other oils throughout the drain period.

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Drain and refill with Macmillan RING-FREE Xtra Heavy Duty. If it doesn't put a stop to sticking valves and excessive engine ping, your dealer will gladly refund your money in full. Macmillan Petroleum Corporation, 530 West Sixth Street, Los Angeles 14, California.

Why Pay a Premium?

LOOK FOR THE BIG, RED "M"

...and pay only 45¢ per quart

MACMILLAN RING-FREE

XTRA HEAVY DUTY MOTOR OIL

Retirement Incomes for men and women

The Phoenix Mutual Plan

How can a man or woman of 40 with no big savings account, nothing but a good job, and 15 or 20 good earning years ahead plan to retire in that time with an income of $250 a month guaranteed for life? How can he start a new life in Florida or elsewhere?

A 28-page booklet, "Retirement Incomes," has been prepared to show how you can use part of your salary now to buy a retirement income for later on.

It explains how you can avoid worries about business ups and downs, how you can obtain an income you will never lose, never outlive. It explains how such plans are used to supplement Social Security benefits.

If you're in your forties or younger and you'd like to retire someday, send for this booklet—whether you're interested in an income of $10 to $300 a month or more, whether you'd like to retire at age 55, 60, 65 or older. This booklet is offered as a public service by the Phoenix Mutual Life Insurance Company. Write for your free copy today. No cost. No obligation. Address: Phoenix Mutual Life Insurance Company, 977 Elm St., Hartford 15, Conn.

work at Bristol Aircraft. The English machine, called the Rotachute, had a two-bladed rotor, a fuselage structure and a hanging control stick much like the Bensen kite's. It was towed to 6,000 feet altitude. Dimensionally and weightwise, it was smaller than the Bensen machine (15-foot rotor diameter and 50-lb. empty weight). It was developed as an assault weapon—a possible replacement for parachutes in paratrooper-type operations.

B. Lindenbaum, Dayton

The Wrong Color of Blood

In your May issue [p. 141], speaking of the physical effects of oxygen shortage, you stated, "As the air gets rarer, the blood gets redder." I thought that blood gets redder as

oxygen is added to it, bluer as the oxygen gets rarer.

Mickey McAdoo, Saddle, Ark.

You are right. We are redder now than we were, but not from an increase of oxygen.

The Volkswagen Argument

I wish to enter a definite but good-natured protest against your article on the German Volkswagen [May, p. 108].

Wilbur Shaw evidently did not have a chance to test this car in the mountains or on winding roads, or he would not have left out remarking on its cornering ability. I have not met its match in any American car.

Rough roads mean nothing to a VW driver. He will take the roughest roads with ease, as I do every day in the week, as a feed salesman, on our goat trails up here. Mud or snow means nothing to this car, either, because of its weight distribution. I was stuck only once last winter—but not for long. I pushed myself out unaided.

Douglas M. Catto, Toronto, Ont.

In your July Letters column [p. 6], Bob Hellis states his Volkswagen is "often within a car length or two of a big Caddy or Olds." He didn't say specifically whether

This *FREE SAMPLE LESSON*

will prove you can become an expert

BOOKKEEPER . . . ACCOUNTANT OR C.P.A.

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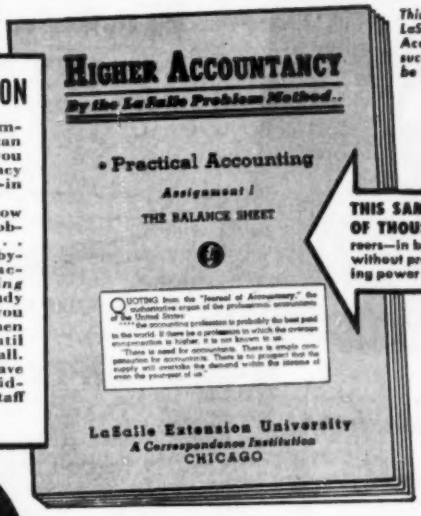

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So right now, today . . . if you are an adult, employed, and earnestly ambitious for rapid advancement in this highest-paying of all professions . . . send your name and address on the coupon below. We'll send the free sample lesson—plus our 48-page book outlining today's career opportunities and how you can qualify for them. A coupon like this has started many thousands toward greater success. It can do the same for you. Mail it today!

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If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Surveys show that accountants earn more than those in other major professions.

There are five big fields of opportunity open to Accountancy-trained men and women . . . opportunities that are wide open and highly inviting, offering maximum income and job security in good times or bad. And under LaSalle's "Problem Method" you can start earning while still learning—either in spare-time or full-time employment . . . or in business for yourself with no capital required.

Get the latest information by sending for our 48-page book, "Accountancy, the Profession That Pays" . . . plus free sample lesson. The coupon at right will bring both to you without cost or obligation. LaSalle Extension, 417 S. Dearborn St., Chicago 5, Ill.

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Street Address.....
City, Zone & State.....
Present Position.....

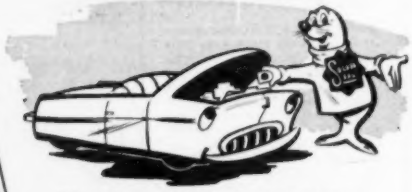
After hard Summer wear... your car's COOLING SYSTEM needs Solder Seal Care!

3 TIPS FOR CAR CARE

Avoid overheating—loss of anti-freeze with Solder Seal

Chemical Tools

1. Before you add anti-freeze DO THIS...

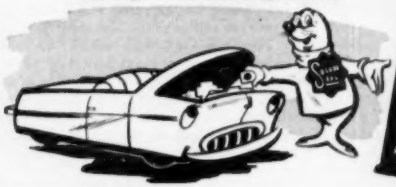


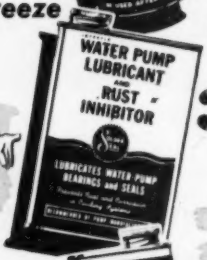
Dissolve and flush out rust, scale and sludge with

SUPER SOLVENT

This powerful cleaner breaks down rust, dissolves scale and sludge so that all are flushed out easily.

2. When you add anti-freeze DO THIS...



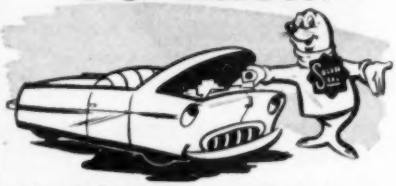


Prevent new rust, corrosion . . . add

WATER PUMP LUBRICANT and RUST INHIBITOR

A soluble oil that lubricates water-pump bearings and seals—stops chattering and squeaks—keeps cooling system clean.

3. Anytime a leak appears DO THIS...



Stop it fast—save anti-freeze with Solder Seal

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Actually seeks out and stops even the tiniest leak . . . with a lasting, durable seal. Prevents new leaks and loss of anti-freeze.

Get all 3 at your Service Station or Garage

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This super penetrant loosens rust and corrosion *in seconds*. Makes mean jobs easy. Loosens rusted bolts, nuts, joints—quickly frees "frozen" parts *without breakage*. Cleans, protects metal surfaces, prevents formation of rust and corrosion. Safe for all metals and alloys.

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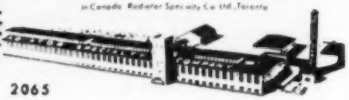

2065

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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He Earned EXTRA MONEY before finishing his TV Course NOW Future Looks Bright!

"Before I decided to quit wishing and start acting to get into Television, I used to be envious of trained people. I saw your ad telling of opportunities in this field and answered the ad. Without a doubt the best decision I ever made was when I decided to take the C.T.I. Television Course.

"I have friends who have studied Television through other schools. I have seen their courses and they have seen mine. Everyone of them admits that C.T.I. is by far the best course. Radio and television are quite complex but C.T.I. has made both subjects easy to understand and also very interesting.

"I have enjoyed building my test instruments and my own TV set. I have been using my test instruments in my service work. Three more lessons and my course will be completed. I have been servicing for several months now and have earned much more than the cost of the course. The lessons on systematic trouble-shooting are especially helpful.

"I feel so much better now that I know something. To have training in a field which is proving to be the biggest field of opportunity for the trained technician gives me confidence and makes the future look bright." JOHN GRILLO, Charleroi, Pa.

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GET THE BEST IN TV TRAINING

TELEVISION—America's fastest-growing Industry—needs THOUSANDS of trained TV Technicians. But the RIGHT Training is Vital. Don't settle for *less* than the BEST. The C.T.I. Home-Shop Training Plan is 100% TELEVISION—not just another Radio Course with some TV Lessons tacked on. Get ready NOW to CASH-IN on TV's great money-making opportunities. Take a Big-Pay job—or have a BUSINESS OF YOUR OWN! FREE Book Explains. Send Coupon Today.

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"I am now half owner in AGS Radio and TV Service at Greensboro, N. C. Our shop is one among many in this section. Yet we have a reputation that is bringing us business from other towns. If it keeps growing, we will probably be looking for a CTI graduate to hire. The present trend indicates we will do around $18,000 the first year. CTI training is one of the best investments anyone can make. I am still enjoying my CTI Television Set which I built while taking my Course." GRADY M. FOGLEMAN, Burlington, N. C.

NOW $3.00 an Hour in TV Service Work

"The C.T.I. course is practical and each step is very clear. Instructors are very cooperative and explain every detail. I am going to open a small TV service shop of my own very soon. C.T.I. training has meant a lot to me. I am doing TV service work now. I make $2.75 per hour. After 8 calls per day I get $1.25 extra for each call. That nets me $3.00 or more per hour." FRANK E. KLAYBOR, McHenry, Illinois

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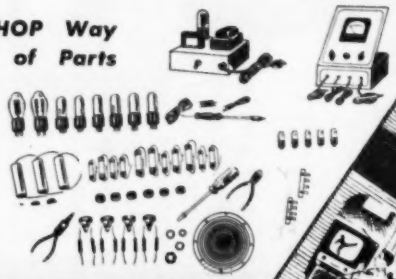
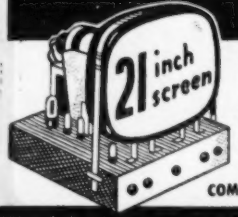
Along with your TV Course, you get 20—TWENTY—Kits of fine-quality Parts, Tools, Professional Equipment. You make Testing Instruments, Trouble-Shooting Devices, other Apparatus, to use on TV Repair and Service jobs. No experience needed when you learn the C.T.I. Home-Shop Way. These and many other features are explained in the Big FREE Book—"YOU and TELEVISION." Send for your copy today.



BUILD your own TV Set



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they were parked or not. If they were moving on the highway, they probably were afraid to fog it or they would have sucked him in clear up to the fan. And that goes for any popular-make American bucket of bolts.

E. V. NICHOLL, Springfield, Ohio

Index Is Not Reprinted

In an excess of house cleaning, my wife tossed out my copy of your July issue, con-

taining the Mechanics and Homebuilding Index. Will you please send me a reprint of it?

THEODORE DEMARS, East Berlin, Conn.

Sorry. We don't make reprints of the annual Index, but we do have extra copies of the July issue on hand, available for 35 cents each. We suggest that you send for one and clip out the Index pages. Or follow Reader Hollwedel's suggestion, printed below.

He Paints His Index Red

In order to find quickly the various "How to Do It" Indexes among my many volumes of POPULAR SCIENCE, I have painted the bound edge of each volume containing an Index with red ink. In addition, I have stained the edges of the Index pages with it, too.

HENRY HOLLWEDEL JR., El Paso, Tex.

Two Engines Too Many

I'm not able to agree with the statistical table in the article on Boeing's new jet Stratoliner [July, p. 121]. It credits the plane with six P & W engines. I say that it has four.

ELMER N. JOHNSON, Quilcene, Wash.

You correctly spotted a typographical error.

A Good Idea, But Already Old

I presume that at present jet aircraft are turned by means of elevators and rud-

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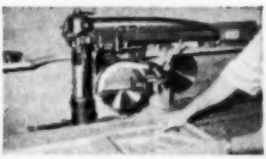

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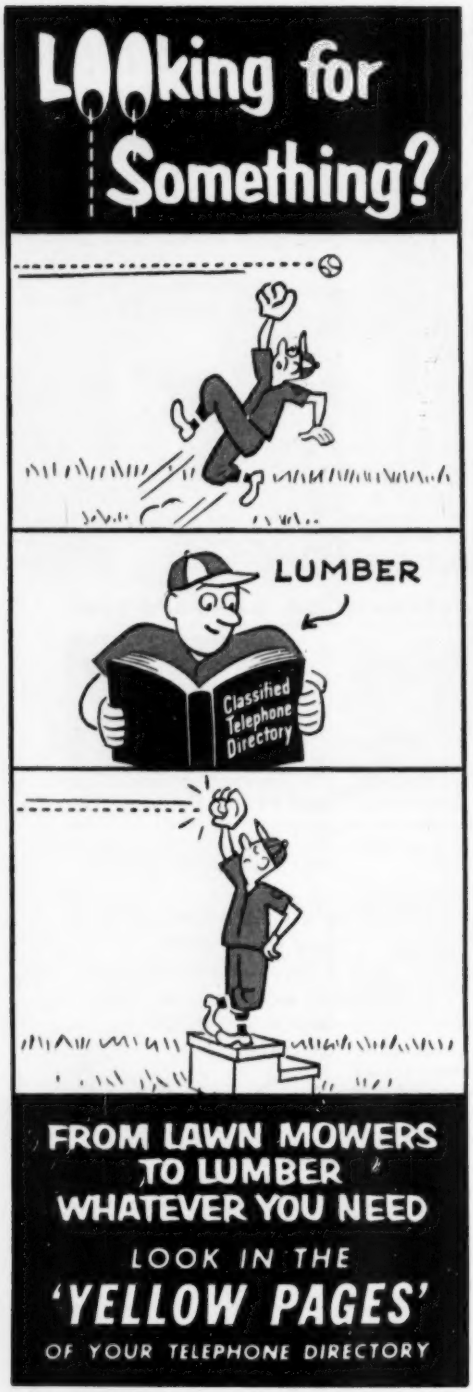

der. I feel this method could be dispensed with if the exhaust pipe were so fitted that its direction could be altered. For example, if the aircraft were required to ascend, the exhaust pipe would be turned in the direction of the ground.

If its pilot wanted to turn to the left or right, he could aim the exhaust in the opposite direction.

W. M. Ranade, Poona, India

A saucer-shaped ram-jet plane incorporating this very method of control [Sept. '53, p. 105] is already under construction in Canada.

A PSM Project Projected

I tried your "Off-Scale but On-Key Bookcase" [Oct. '53, p. 244] this spring in my general shop class for first-year high-school youngsters. Ten bookcases were made—six of them by girls! Three students decided to add front legs and one of them, as is shown in the accompanying photo, wanted a piano bench to match.

S. Schirmacher,
Industrial Arts instructor,
Cottonwood High School,
Cottonwood, Ariz.

What's the Best Color for Heat?

You were in error when you advised your readers to paint radiators with "a flat wall

paint of a light color for the most efficient heat radiation" [June, p. 189]. The exact opposite is true.

E. J. Sweeney, New York, N.Y.

So it is. Ideally, a radiator should be painted black, but no housewife will stand for it. A flat finish, however, is more efficient than a glossy one.

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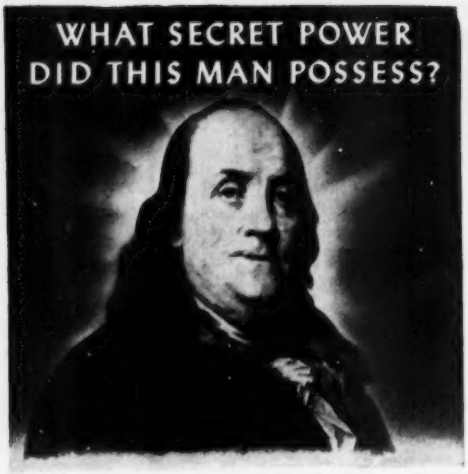

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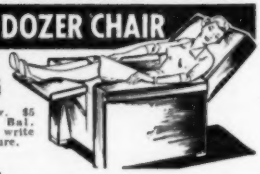

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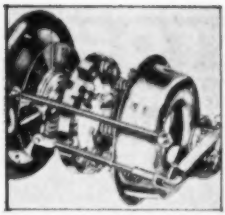

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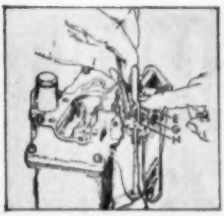

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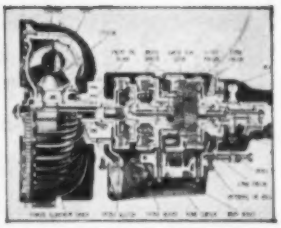

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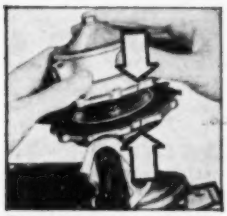

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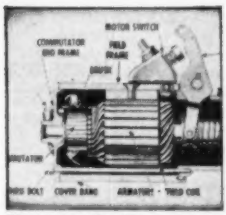

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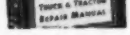

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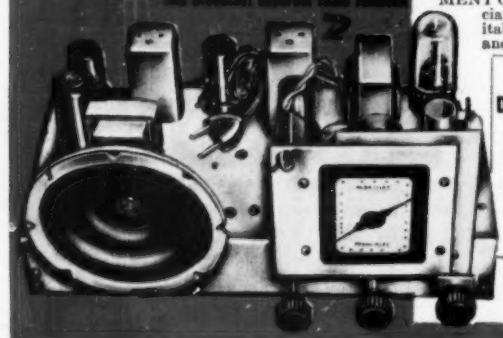

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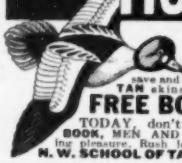

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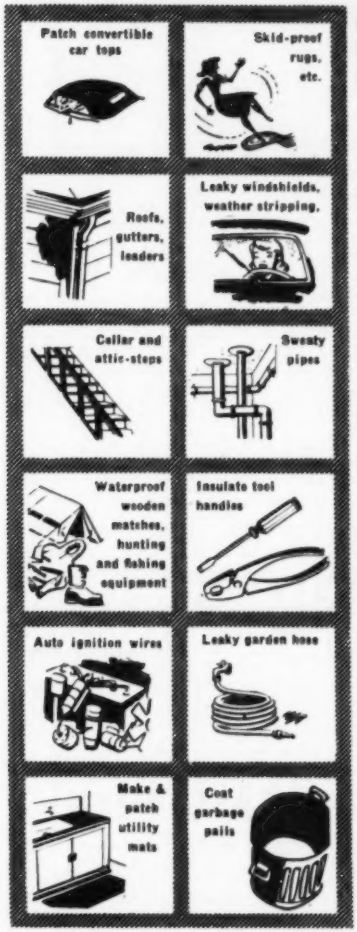

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Not only is RUB-R-IZE amazingly versatile when you want to mend or repair, *but you'll be astonished when you discover the number of things you can actually make with it!* Just dip, let dry, peel off, and PRESTO!—bathing caps for the entire family! Use several layers of RUB-R-IZE to make as good a shock-proof rubber heel as you'll ever want to have! Rust-proof leaky roofs, gutter runways, and leader pipes...

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RUB-R-IZE, the natural liquid rubber, offers this 100% money-back guarantee: If RUB-R-IZE doesn't do everything claimed for it on this page, and MORE; if RUB-R-IZE isn't exactly what we say it is; and IF YOU ARE NOT 100% SATISFIED AFTER A THIRTY DAY TEST THAT RUB-R-IZE HAS DONE A WONDERFUL JOB FOR YOU...then return the unused contents of the can, and we'll refund your money. YOU be the judge; you risk nothing!

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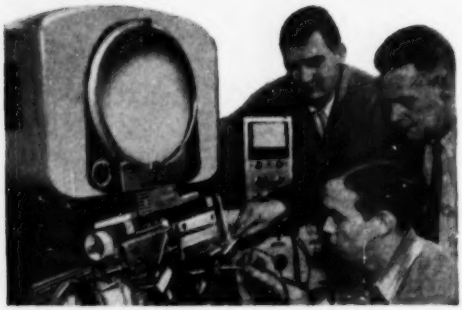

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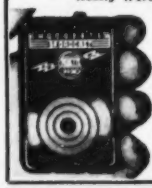

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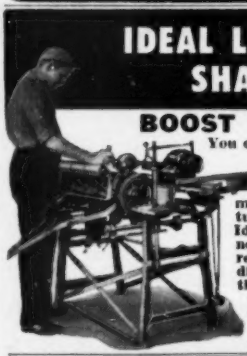

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Start on a SHOESTRING!

The real-life stories of success in Mail Order read like fairy tales. If I had not personally known these people their stories would be hard to believe. Yet they are not only true, but they represent just a few of the hundreds of "little operators" who have been swept into big money by Mail Order.

GAINES. I personally guided his start when he invented an automatic pants presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

VAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start —ended up six years later with savings of $50,000 and an income of $5000.00 a year for life without further work.

DUGGAN. A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, "I don't know how much I'm worth—after you get the first million you quit keeping track."

MRS. NIXON. Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

FOXMAN. Foxman worked as a hack writer at $70 a week. He had idle time in the evenings—ran an ad offering something he didn't have—got so many orders he had to find a source of supply. He made $18,000 the first year. He gives me credit for "showing the way."

JORGENSON. Consulted me about a specialty product. On my advice he ran one ad to "test" its saleability. That ad brought sales of $50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

These things I have seen. These people I have helped to the realization of their dreams — these and hundreds of others. My own fortune was made in Mail Order. And now my secrets can be yours.

L. W.

Have you ever thought of running a profitable little sideline right from your home? Has it occurred to you that *you are just as capable as anyone else* of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it's run (on tiny investments) by innumerable small operators?

Forget about Sears and Ward's! *Read about the "little fellows"* . . . clerks, teachers, vets, mechanics, salesmen and others . . . who are packing Mail Order items in bedrooms, spare rooms, attics, garages, cellars . . . dumping them in the Post Office . . . and quietly banking the fistful of Money Orders, cash and checks delivered to them daily by the mailman.

An annual business of almost a billion dollars is done by "little fellows" who advertise and sell *just one item!* The Department of Commerce of the United States says, "A number of the most successful obtain incomes as high as $40,000 to $50,000.00."

It's an incredible story . . . a story of a business that's wide-open for newcomers . . . with opportunities for income far-and-away greater than you can ordinarily hope to attain by holding down a job. And in Mail Order you can stay as small as you wish—run your deal as a $50 or $75 weekly sideline—or consider jacking it up into really big figures as a full time operation.

Glance at the examples at left. *These true stories are far from unusual.* Multiply them by the hundreds and you begin to get an idea of what can be done . . . what *is* being done . . . in the phenomenal Mail Order field.

• • •

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of "know-how" is vital in this little-known, little-understood business. *This is fortunate for you.* If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloaded years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . *the L.W. Confidential Mail Order Letters.*

This Survey is not a course—not a book—not a group of lessons. It is a simple guide that anyone can follow. It shows you how to pick the right product for Mail Order. It shows you exactly how to start a profitable business *fast*, with cash or Money Orders in the envelopes you receive. It shows how to buy your product out of the very money you get in the mail, so you don't have to tie up cash in large supplies of your product. It gives you actual examples of ads and letters, *analyzed to show how and why they make money.* It demonstrates the months to start, the time to expand, the best way to get prospects' names. It reveals from A to Z the confidential facts that have made fortunes for Mail Order operators who use them.

Mail the coupon today, or simply send your name and address on a postcard. No salesman will call. We will mail, postage prepaid, a *Free* copy of "How to Become a Mail Order Millionaire" and along with it will give you complete facts about the L.W. Mail Order Survey. Read the facts. Then decide whether you would like to spend spare time or full time in a profitable, fascinating Mail Order enterprise. If you think you would like to follow the footsteps of hundreds of others who are now making good money in this way, you can get your L.W. Survey and begin at once.

Please don't decide to write us "a little later." Send your name *now*, before you forget. This one little act might be the first step to a future of independence and wealth.

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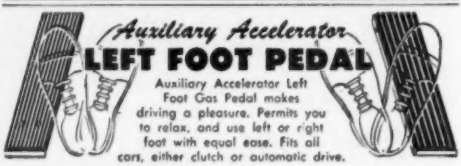

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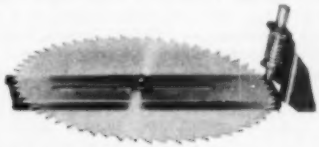

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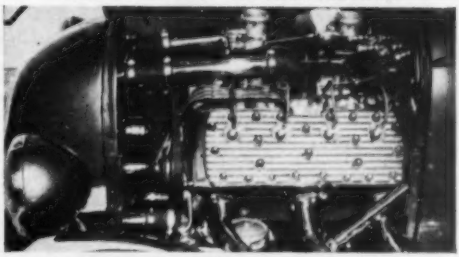

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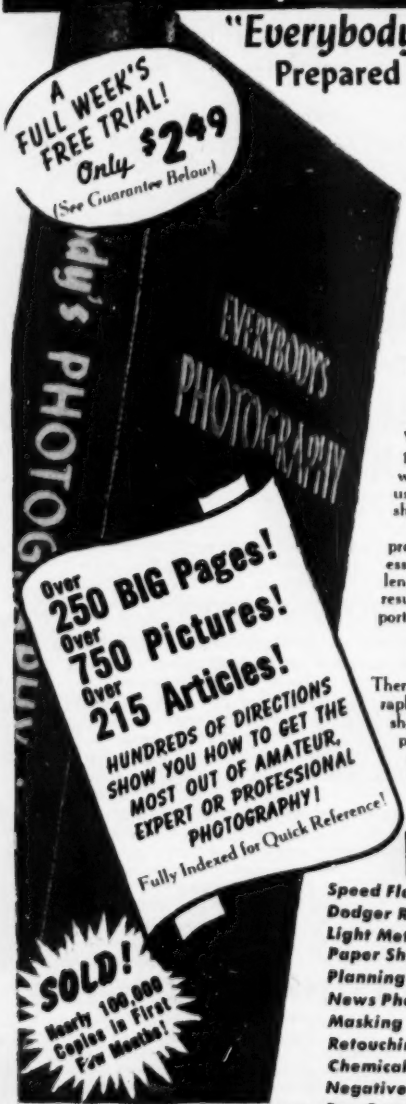

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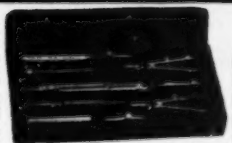

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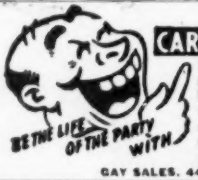

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My new pipe is not a new model, not a new style, not a new gadget, not an improvement on old style pipes. It is the first pipe in the world to use an ENTIRELY NEW PRINCIPLE for giving unadulterated pleasure to pipe smokers.

I've been a pipe smoker for 30 years—always looking for the ideal pipe—buying all the disappointing gadgets — never finding a single, solitary pipe that would smoke hour after hour, day after day, without bitterness, bite, or sludge.

With considerable doubt, I decided to work out something for myself. After months of experimenting and scores of disappointments, suddenly, almost by accident, I discovered how to harness four great natural laws to give me everything I wanted in a pipe. It didn't require any "breaking in". From the first puff it smoked cool—it smoked mild. It smoked right down to the last bit of tobacco without bite. It never has to be "rested". AND it **never has to be cleaned!** Yet it is utterly impossible for goo or sludge to reach your tongue, because my invention dissipates the goo **as it forms!**

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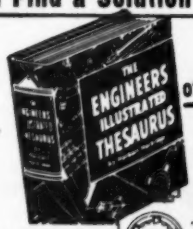

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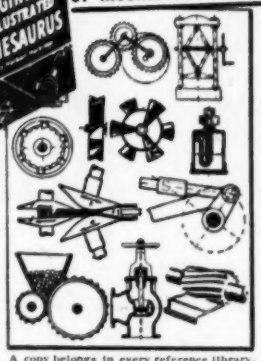

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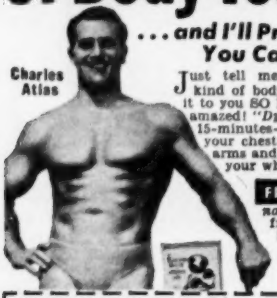

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700x16	6.15	760x15	5.75	750x15	10.45	900x20	17.65
750x16(6)	8.35	800x15	6.05	825x15	10.45	1000x20	16.55
550x18	3.95	820x15	6.15	600x20	8.75	1100x20	17.05
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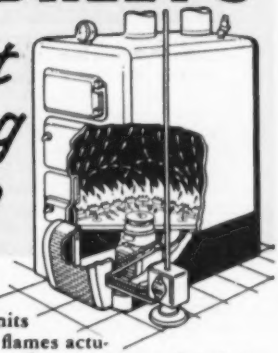

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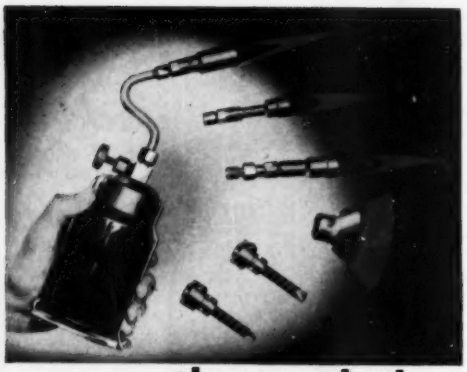

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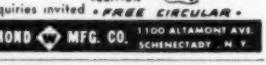

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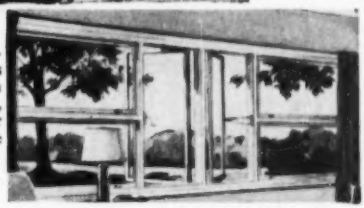

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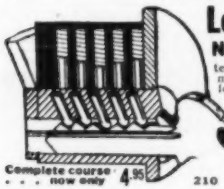

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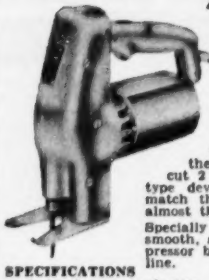

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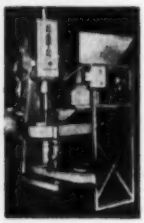

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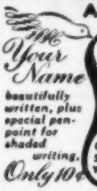

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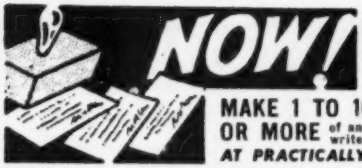

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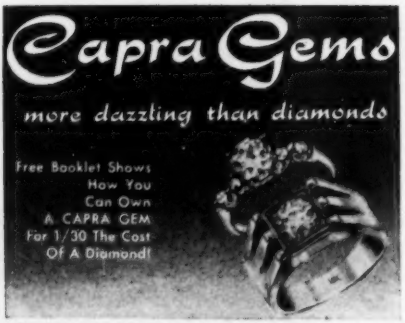

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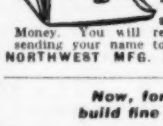

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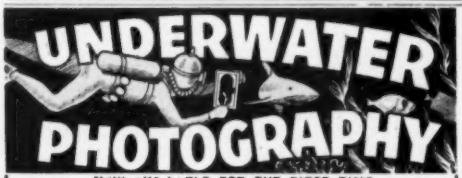

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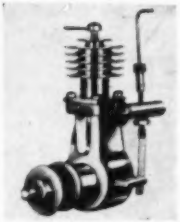

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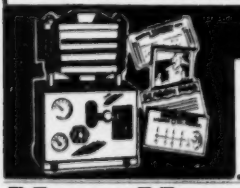

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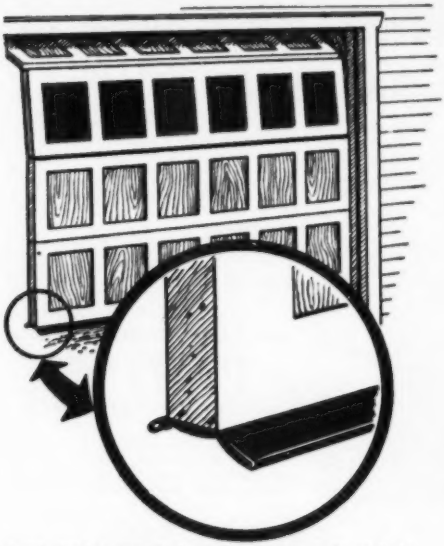

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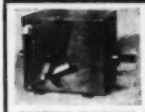

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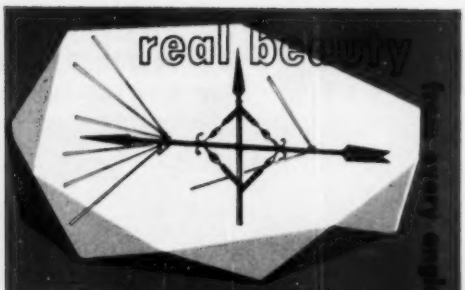

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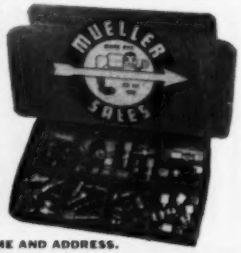

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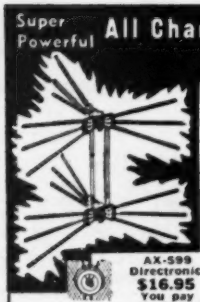

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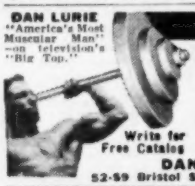

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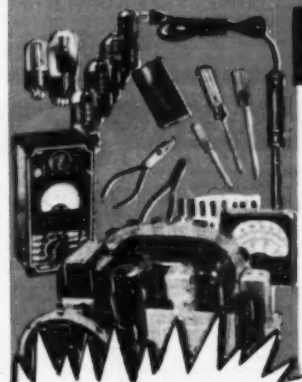

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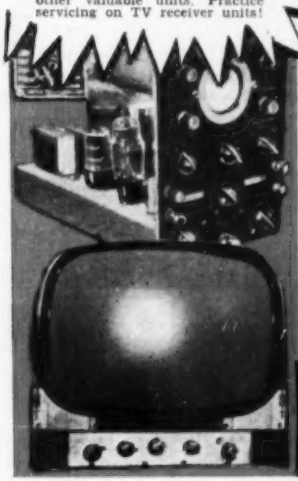

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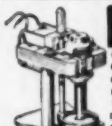

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SAMPLE Iron Ore, 19 colored pictures of mine operation 50c. Greenlee, Box 662, Two Harbors, Minn.

1954 PROSPECTOR'S Gazette: Rush 25c. National Prospector's Gazette, Bellflower 51, California.

31 HOBBIES, COLLECTIONS

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32 PHOTO FINISHING, PHOTOCOPIES, ETC.

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SONGWRITERS! Send poems, songs. Music Service, 243 West 72nd St., PS, New York 23.

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CRYSTAL Radio experimenters. Write Leslie Hulet, R. 4, Lakewood, New Jersey.

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OWN Operate Route—"Wishing Wells." Place these New $8.50 Skill Games on counters in Cafes, Clubs, Luncheonettes, etc., collect coins weekly. Write "Legalsheres." Box 929, Long Beach 1, Calif.

SEND out postcards. Get paid daily. Box 9, Watertown, Massachusetts.

MINIATURE Trees. Why pay $2.00—$10.00 for growing secrets? Free Details. Tiny Trees, 5038 N. Winthrop, Chicago 40.

MAKE Money mailing Merchandise catalogs, bearing your name. Sample, details 25c. Products, 526 Western S., Chicago 12, Illinois.

LOWER priced Metal Baby Shoe Mountings. Foster's, 1520 Ardmore, Chicago.

BOOKLET "Your Business At Home", $1.00. Home Industries Association, Dept. PS, 1727 K Street, N.W., Washington 6, D.C.

NEW highly profitable business. Free information. Jeweled Textiles, 5340 Forbes, Encino, California.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior E E5, Wisconsin.

MAKE flexible molds. Cast plaques, figurines. Free sample. Tooker, 630-A Chestnut, Hamilton, Ohio.

WANTED! Home Producers, by manufacturers in our Clearing House Service. Become subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer-industrial use. Cash in at home, without previous experience. Plastic Service Associates, Dept. 9-PS, East Boston 28, Massachusetts.

BUY Wholesale—sell retail Brand Name appliances, watches, etc., Full details—Catalogue 50c. International Sales Co., 175-B Fifth Avenue, New York 10, N. Y.

GET $10.00 Orders by Mail! 100% profit! Everything furnished. Terrell, Bogard, Missouri.

"MAKE Perfumes," other products—Sell mailorder—Formula, Catalogue Free. "International," 6347 Farnell-PS-9, Chicago 21, Illinois.

TRADE Magazines. See late copies through our easy to get acquainted service. Choose from 4,387, covering all fields. Current List Free. Commercial Engraving Publishing Company, 348 North Ritter, Indianapolis 19, Indiana.

MONEY in saw sharpening sparetime at home. Repeat cash business. Experience unnecessary. No selling. Free booklet explains. Charles Foley Company, Columbia Heights, Minnesota.

LEARN Invisible Reweaving! Harris Reweavers, P.O. Box 7112, New Orleans 19, Louisiana.

CO-PUBLISHING moneymaking opportunities! 10c. P.M.T., 612 Rogers Street, Albemarle, North Carolina.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries, Grand Rapids "Minnesota."

$250 WEEK reported! Free book "505 Odd, Successful Businesses." Work home! Expect something Odd! Pacific-36C, Oceanside, California.

EARN $2.00 Hour! I do—making Sandals. Youngs, 1308-PS South First, Arcadia, California.

START Venetian Blind Laundry. Profitable lifetime business. New machine. Free booklet. F.D. Co., 442 N. Seneca, Wichita 12, Kansas.

FREE Folio "$45,000; Unlimited Vacations Plan." No canvassing, mailorder, merchandise, equipment. Unknown. Works itself—home! Keep job. Haylings-PS, Carlsbad, Calif.

NEW—Different Home Business Opportunity! Address-Mail Literature Featuring Real Merchandise. Everything furnished. Mills, 1752-B, Garden Avenue, Lorain, Ohio.

MONEY Typing—Sewing! Details free. Edwards, 3915-PS, 12th, Des Moines 13, Iowa.

$$$$ IN personalized baby record books. Sell by mail. Eleven thousand new prospects daily. Use same literature we do. No-Co-Ro, Oakland 6-P, California.

UNUSUAL homework opportunity. Spinning angora for us. Men, women, sparetime. Angora House, PSM, Springfield, Ill.

BUY it wholesale. Manufacturers, Distributors. Over 850,000 items. Literature free. Olsen, 1231-B East Third St., Duluth 5, Minnesota.

$46 FROM Square Foot Plywood; Jigsaw necessary. Write: Woodart, Bridgewater, Massachusetts.

CONFUSED? Look under column Educational & Instruction, for ad by Miniatures.

BIG profits in your own wholesale merchandising business. No investment. America's greatest wholesale Appliance, Homewares, Jewelry catalog in color with your own name. We drop ship. Write General Wholesalers, Box 1195FG, Chicago or Box 3058FG, San Francisco.

$1.00 MAILORDER Item. Light Mailer. Prospects, Every Home. Circulars Furnished Free. Gordon Products, Box 1022A, Syracuse 1, N.Y.

CAN'T Lose—Easy home operated business, two way system, dignified, write: R. Casto, Kenna, West Virginia.

OPPORTUNITY Seekers! Get real information. Details, $1.00 (Money order). Welcome Projects, P.O. Box 654, Altoona, Pennsylvania.

PLASTERCRAFT molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Jayhawk Plasters, Blue Rapids, Kansas.

10,000% Profit! Details Free! Star Industries, 366 Eden, Glen Lake, Minnesota.

MAKE over $100 weekly! Details $1. P. O. Box 61, Back Bay, Boston.

$15.00 THOUSAND Possible—highest prices compiling mailing lists and addressing from them; longhand, typewriter. Particulars free. Economy Publishers, Rowley, Mass.

37A CLAIM INVESTIGATORS

INVESTIGATE Accidents—Earn $750 to $1000 month. Thousands of insurance companies, airlines, and steamship lines urgently need Claim Investigators. We train you at home spare time. Placement counsel and help. Free book—Now! Universal Schools, Dept. B-9, Box 8202, Dallas 5, Texas.

POPULAR SCIENCE OPPORTUNITIES

MONEYMAKING OPPORTUNITIES

SPARETIME Profits Taking Subscriptions. All Magazines. Wholesale Catalog Free. Cassell Agency, Westfield 1, N. J.

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work Home! Start Sparetime! Deumant Surveys, Kenmore 23-S, New York.

NEW 7"x11" Ultra-Blue Signs, 7c, retail 50c. Samole free! Lowy, 812 Broadway, Dept. 812, New York 3.

DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner, P-125 West 86th, N. Y. 24.

MAKE money addressing envelopes sparetime. Glenway, 5713 Euclid, Cleveland 3, Ohio.

WIN contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

START a profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions paid for new and renewal subscriptions. Start earning money in this pleasant work at once! Clip this ad and send with your name and address to: Agency Bureau, Dept. PS, Hearst Magazines, 250 West 55th Street, New York 19, New York.

BUY Wholesale! 30-80% Discounts! Free! Large Catalog of Nationally Advertised Appliances, Gifts, Watches, Jewelry, Cameras, Typewriters, Tools, Kitchenware, etc. Start Your Own Fully Self-Operating Mail Order Business Without Capital! No experience Necessary. Wholesale Starting Kits Furnished. Outline of Unique Automatic Sales Plan Included. Consolidated Distributors, Division 122, 21 Lafayette, Paterson 15, New Jersey.

MAKE extra Christmas Money selling subscriptions spare time. Supplies free. Desales Magazine Service, 60 East 42nd Street, New York.

DOLLARS flood your mail from just one small ad. Instruction and copy $1.00. Zaruba, 4941 School, Chicago, Ill.

FRENCH-Type Perfume Really Sells!! Free information, or, $1.00 for 1½ dram "Flacon". Elliott-Stuart, 4616-B Hollywood Blvd., Hollywood 27, California.

MAKE Money At Home as renewal headquarters for all magazines. Big Christmas sales profits now. Liberal commissions. Supplies furnished. Write for Free Catalog. McGregor Magazine Agency, Dept. 510C, Mount Morris, Illinois.

ADDRESS Envelopes at Home spare time $50.00 Thousand. Information 50c Refundable. Fisher-A, 3213 Mission, San Francisco, Calif.

FREE! Sensational Money Making Ideas! Boyer, 65 Uptown, Hoboken, N. J.

MAKE Money! Addressing advertising post cards, good handwriting necessary. Wyatt, Box 5465, Tampa, Florida.

MAIL Letters Featuring Real Merchandise—Get $10 orders in Every mail—100% profit. Everything furnished. Write Everett A. Anderson, Box 3, Wheeler, Ore.

MILLION products wholesale. List of sources 50c. Fitzpatrick, 1842 Jeanette, Abilene, Texas.

BUY wholesale nationally advertised watches, jewelry, appliances. Sell from new 1955 catalog. Invest no money. Earn $50 daily. Louis Perloff, Dept. PS, 733 Walnut St., Philadelphia, Pa.

SELL-buy Titania Gems. More brilliant than diamonds. $9.75 carat wholesale. Free Catalogue. Diamonite, 1404-S Mitchell, Oakland 1, California.

EXTRA Money At Home. Grow Miniature Christmas and ornamental trees in pots. Write for information on our plan and Kit. Don Pedro Farms, Rte. 2, Box 1007A, Stockton, California.

FREE. Profitable Mailorder Plans. Welle Company, 6006 Floyd, Houston 7, Texas.

MANUFACTURE Rhinestone and Pearl Jewelry at home. Latest creations, tremendous profits, no skill needed. Postcard brings illustrated catalog of settings, stones etc. A. V. Cutt Co., Inc., 210-H Fifth Ave., New York 10, New York.

MAKE to $4.50 hour doing common pen lettering. National Artists, 801½-C North Marsalis, Dallas 3, Texas.

EARN Money Evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 2, Wisconsin.

START A Buying Service, buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers', 630-T Linden, Buffalo, N. Y.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time year round. We pay $3.50 lb. We paid Babbitt $4,165.00 in few weeks. Free Book. Washington Mushroom Ind., Dept. 179, 2954 Admiral Way, Seattle, Washington.

FUTURE Security! Learn Watch-Clock Repairing at home. Inquire. Modern Technical Supply, 55-PS West 42nd Street, New York 36.

WEEKLY extra income mailing circulars for advertisers. For information write Enterprise, 2146 Sanford, Mattapan 26, Massachusetts.

PRESERVE Living Flowers to last for years. Interesting hobby. Make money too. Free details. Goll Enterprises, 124-S Washington Avenue, Patchogue, New York.

$60.00 WEEKLY addressing postcards. Instructions 50c. Roland, Box 381, Parkland, Pennsylvania.

$1,000 PROFIT fast! Sell nationally famous Appliances, Homewares, Jewelry everyone buys. Profits unlimited. Free details. National Buyers Service, Box 426PL, Oakland, California.

NEED Money? Raise earthworms. Complete information 10c. Earthworm Gardens, 41 Peacock Bldg., El Monte, Calif.

METAL Specialty Business pays big. Write Fran Council, Box 150, Wildwood, New Jersey.

PAINT—Sell figurines, plaques, circular 10c. Novelties, 105F Parkway, Tiffin, Ohio.

EARN Ready Cash Addressing Envelopes at Home—Our Instructions Show You How—T. Wilson Business Service, 7372 Melrose Avenue, Los Angeles, California.

SCHOOL Seniors — Sell Classmates America's most beautiful Graduation Name Cards. Largest selection. Highest commission. Outsells all others. Free sample kit. Printcraft, Dept. P, 1509 Maple Street, Scranton 5, Penna.

SEND out postcards. Get paid daily. Box 9, Watertown, Massacnusetts.

TYPISTS! Make money at home! R&M, 2 Madison, Greencastle, Indiana.

NEED extra money? New plan. No investment. Sparetime. Sample, details free. Transamerican, Box 815-B, Atlanta 1, Georgia.

ATTENTION: Typewriter owners. Make handsome profits. Write today. Groves Company, 682 Hastings 3, Nebraska.

MUSIC at your door!—Can put dollars in your pocket! Sensational new chimes plays favorite melodies. Sells on hearing. Only $9.95. Details Free. Westwin, 647-A Goulding, Winnipeg, Canada.

CASH for used watches, jewelry. Write Southern Watches, Gray, Georgia.

EXCEPTIONALLY Profitable Home Mailorder Business Plans. Lewis Bartlett, Richland, Georgia.

FREE Wholesale price information. Nationally advertised merchandise. Speedway, 2320 N. Raynor Ave., Joliet, Illinois.

DOLLARS in your mailbox daily, no stock investment. How $2. Gem, 44-B Atlantic, Pleasantville, New Jersey.

$35 WEEKLY addressing envelopes. Instructions $1, refundable. Adservice, Spring Valley 36, New York.

FREE Book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-35C, Oceanside, Calif.

$200 MONTHLY Possible Raising Earthworms! Backyard, Garage, Basement. Complete, Illustrated Booklet explains raising, feeding, packing, marketing. 25c postpaid! Ozark Worm Farm-V, Willow Springs, Missouri.

FREE Folio "$45,000; Unlimited Vacations Plan." No canvassing, mailorder, merchandise, equipment. Unknown. Works itself—home! Keep job. Haylings-PS, Carlsbad, Calif.

MAKE Big Money Raising Parakeets for our market. Positively no selling. Birds, instructions furnished. National Aviaries, Box 4097-S, San Diego 4, California.

UNLIMITED Earnings, operating practical mailorder plan; small capital, details free. Llanerch Sales, 24 E. Langhorne Ave., Havertown, Pa.

SMALLER Paycheck? Add to your income. New plan. Plastics. Dept. AJ, 10024 Mayfair Drive, St. Louis 21, Missouri.

MONEY, Making Signs. New Easy Way. Paradise Specialty, Box 4806, Paradise 4, California.

EARN real money! Reasonable profits. Begin living. Opportunities galore. Details $1.00 (M.O.) Unusual. Welcome Projects. P.O. Box 654, Altoona, Penna.

$15 HOUR preparing tax returns. Become Tax Expert. Write Union Institute, 1-N, Lakewood, New Jersey.

FREE! Complete Mailorder Business! Terrific Profits! No Investment! VitaMins, 2908-PSX Beverly Boulevard, Los Angeles 57.

39 FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 15, Ill.

ANY Formula $3.00. Catalog — Mfg. Treatise 10c. J. Belfort, 192 N. Clark, Chicago 1.

$3.00 FOLIO Collection of 1&2 Ingredient Formulas. Your Price only $1.00. Richmond Enterprises, Box 1003, Augusta, Ga.

MODERN Formulas. Literature Free. Jack, Chemist, 5138 Gainor Road, Philadelphia 31.

REAL Manufacturing Formulas Lists Free. Cumming, Chemist, Gordon Avenue, Syracuse 4, New York.

FREE Formula Catalog. Anything analyzed $35.00. Western Chemical, Salem, Ore.

LATEST modern real manufacturing formulas, list free. Moon, Martville, N.Y.

MODERN formulas for today's fastest selling big-profit products. Literature free! Miller, Chemist, 1517-A, Tampa, Florida.

40 PLASTICS

PLEXIGLAS, Lucite. Any size sheets. Square foot (12x12) cost, 1/16", $1.18; ⅛", $1.55; 3/16", $1.90; ¼", $2.25. Add 15% for postage. Minimum order $3.00. Almac Plastics, 600 Broadway, New York City.

PLASTICS home-craft course for Men and Women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for Free booklet. Interstate Training Service, Dept. D-2-J, Portland 13, Oregon.

PLEXIGLAS sheets—cut to size—clear, all thicknesses—standard outdoor translucent colors. McClarin Plastics, P.O. Box 168B, Hanover, Pa.

PLASTIC Sheets, Rods, Tubes; etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

UNUSUAL Christmas decorative materials included in complete plastics catalogue. Van Horn Plastics, 1905 Ingersoll, Des Moines, Iowa.

PLEXIGLAS, Lucite. Square foot cost 1/16"—$1.16, ⅛"—$1.53, 3/16"—$1.88, ¼"—$2.23, ⅜"—$3.28, ½"—$4.38. Colors add 10%. Send 10% for postage. Aristocrat Plastics, Inc., 55 Clarkson Street, New York City.

POPULAR SCIENCE OPPORTUNITIES

CASTING plastic, crystal like, new improved formulation, 1½ pounds liquid Numold and complete kit including colors and instruction manual. You too can start profitable casting and embedding hobby at home. Only $6.00 postpaid, send to Virginia Research Laboratory, Dept. B9, Marion, Virginia.

PLEXIGLAS, Fiberglas, Polyester, Acetate, Vinylite: Casting, coating plastics: Fast service, wholesale-retail prices. Catalog 10c. Gem-O-Lite, Box 6862P, North Hollywood, California.

41 CHEMICALS & APPARATUS

NEW Idea Chemical and Apparatus Outfits for Home Experimenting Photo-Scales, Microscopes, Chemicals, Biological and Laboratory, Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York, N. Y.

SENSATIONAL Supplies Catalog; 10c—refundable. Hagenow Laboratory, 2414 Clark, Manitowoc, Wisconsin.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS, Supplies. Catalog 20c. Laboratory Sales, Box 161-B, Brighton, Massachusetts.

CHEMICALS and apparatus for industrial, analytical and private laboratories. Catalog 25c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N.Y.

CLOUD Chambers, $9.75. Write for free specifications. Atomic Laboratories, Box 243, Berkeley, Calif.

42 HELP WANTED

FOREIGN & Latin American Employment 1954 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply application forms. Hot List Firms Hiring. $1.00 postpaid. Global Reports, Box 883-S, Hollywood 28, Calif.

ALASKA!! Last American Frontier. $1.00 brings 1954 Business Directory & Government Map, Military & Civilian Construction; Homestead & Highway facts; Mining, Aviation, Fur Farming, Grazing, Timber, Travel directions. List of firms hiring. How to apply. Alaska Opportunist, Box 92-S, Hollywood 28, Calif.

FREE Information now available about Foreign and U.S.A. job opportunities paying to $1500 monthly. Write immediately. Dept. AD, National Employment Information Service, 1020 Broad, Newark, N. J.

HOMEWORKERS. Men, Women, Hand lace moccasins. Easy—Profitable. California Handicrafts, Dept. 60, Hollywood 46, California.

BIG construction projects now under way in Canada and abroad. Outstanding pay. Complete information for only $1.00 to Service Bureau, Box 116 Stn. B, Hamilton, Ontario.

FOREIGN-U.S. Jobs. So. Am., Alaska; Spain. Fare Paid. 1000's U.S. Jobs to $18,000. Trades, Office, Factories. Stamped self-addressed env. brings reply. Job Opportunities, Waseca 28, Minnesota.

ADDRESS Advertising postcards. Good handwriting necessary. Box 5465, Tampa 5, Florida.

$245 PER week overseas! Clerks, truck drivers, cooks, construction men, guards, office workers, laborers, carpenters, electricians, mechanics, engineers, teachers, factory workers, many other classifications. No experience needed, some jobs. 254 projects, 58 countries. Get 56 page illustrated job catalog, "Firms Seeking Applicants" bulletin, applications, complete, $1. Jobservice D-1, Box 30, Billings, Montana.

$335.00 MONTH sailing Great Lakes. No experience. Full information $1.00. Greenlee, Box 662, Two Harbors, Minn.

"ATTENTION Construction Men!!" Truck Drivers—Carpenters—Mechanics—Electricians—Clerks—Plumbers—Laborers—Engineers—Supervisors—Many Others. Latest Copyrighted Reports on who to contact for highest paying jobs in over 42 countries, including U.S., Spain, South America, Alaska, Europe, Africa, etc. Pay up to $1550.00 monthly. Transportation paid, income tax relief, adventure, travel, overtime, many other advantages. One year registration and advisory service. Application forms. Only service with unconditional money-back guarantee of satisfaction. Immediate service. All only $2.00. Airmail $2.25. (COD's accepted). International Reporter, Box 1047-SG, St. Louis 1, Missouri.

SEND out postcards. Get paid daily. Box 9, Watertown, Massachusetts.

HIGHEST pay area, Pacific Northwest booming lumber industry. Jobs all types. Men and women. Information and listings, $1.00. Northwest Opportunities, Box 775, Portland, Oregon.

TELEVISION can be your stepping stone to success. Learn how you can become a Television cameraman, announcer, producer or director. Also complete listings of new stations and best contacts for employment in Television. Send $2 or C.O.D. plus postage. Progressive Engineering, Box 3142-A, St. Louis 5, Missouri.

$1300 MONTHLY for truck drivers, $1400 monthly for carpenters, electricians, plumbers, mechanics, $1200 for clerks and laborers. Replacement hiring now being done. Full information and complete foreign listings, with current information on Spain, Korea, Australia, Alaska & Canada. $1.00. 10,000 men and women needed for new stateside project! Complete information and other domestic listings, $1.00. Dept. 4-I, Opportunities Unlimited, 1110 Commerce Bldg., St. Paul, Minnesota.

JOBS Out of Town. Current want ads $1.00 any city. American Business Improvement Company, 521 Jerome St., Brooklyn 7, New York.

INVESTIGATORS wanted. Handle from home. Work furnished. Write National Correspondence Service, 1754 Van Buren, St. Paul 4, Minn.

HIGH-Paying Jobs. Foreign and American. Worldwide construction needs Clerical and all Construction Trades; wages to $1400 monthly. Satisfaction guaranteed. Send $1.00 immediately to Worldwide Opportunities Joblist, 140 West 42nd Street, New York City.

43 AGENTS WANTED

AGENTS—300% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-E North Clark, Chicago.

START Your Own Business on credit. Your own boss. 1661 of our Dealers sold $5,000 to $28,500 in 1953. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant, profitable business backed by world-wide industry. Write Rawleighs, Dept. I-U-PSC, Freeport, Ill.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 18, Chicago 4, Illinois.

ABSOLUTELY Free—Sales Kit. Yours for the asking. Send postcard today requesting kit showing new line, belt buckles with your name or personal initials, cap badges, choice 3000 different emblems. Write Hook-Fast, Box 1425PS, Providence, R. I.

GOLD or Silver letters, numbers. Windows, Doors Trucks. 1" to 6". 500% Profits—Free Samples. Atlas-U, 544 West 79th, Chicago 20.

HAVE a complete store in your pocket. Buy wholesale and make big profits. Send for free general merchandise catalog now. Jay Norris, Dept. PS, 445 Broome St., New York City.

ADVERTISED watches, diamonds, pens wholesale. International, 61M Roberts, Portland 4, Maine.

MONEY For Xmas! Make $50 and more during spare time. Friends, neighbors—everyone buys from Elmira's exquisite New Sparkling Line. Imprinted Christmas Cards for As Little as 3c. Personalized Stationery, Napkins, Large Gift Wrappings with Free accessories, Ribbon Ties . . . all fine quality Money Saving Values. No experience Needed. Send Name and Address for Free Portfolios, Catalog, Assortments on Approval, Bonus Plan. Elmira's "Portable Gift Shop" Makes Money First Day. Write Today. Elmira Greeting Card Co., Dept. C-205, Elmira, New York.

IT'S so terrific you'll actually sell Thousands! Brand new $2.95 pocket check protector. Sales pouring in. A tremendous deal for you. Get your town today. Federal Products, Evanston 15, Illinois.

AT Last! Something New and Sensational in Christmas Cards. Make Extra Money Fast! Show Satins, Velours, Metallics. Gets Easy Orders. Pays up to 100% cash profit. 30 Free Samples. With name 50 for $1.50. Big line. Amazing new Glitter-Brite Ornaments, Napkins, Gifts, Stationery. Several $1.00 Boxes on approval. Puro Greetings, 2801 Locust, Dept. 441-L, St. Louis, Mo.

ANYONE Can Sell famous Hoover Uniforms for beauty shops, waitresses, nurses, doctors, others. All popular miracle fabrics—nylon, dacron, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. F-101, New York 11, N. Y.

BIGGER Profits selling Greeting Cards. Get list of sensational Factory Surplus Bargains. $1.25 boxes for 50c. $1 boxes for 35c—while they last! Big line new 1954 Christmas Cards, Stationery, Gifts. Assortments on approval. Personalized Samples Free! Midwest Cards, 1113 Washington, Dept. J-136, St. Louis, Missouri.

70 NEEDLEBOOK with threaders $7.20 gross. 31 piece plastic Christmas decorating kits $3.00 for 10 sets. 5,001 other Bargains. Many samples & catalog $1.00. Mills Sales, 26 West 23rd Street, New York.

BIG Money making opportunity. Exclusive line work uniforms, Jackets, pants, shirts, coveralls. Advertising embroidered. Every business prospect. Outfit Free. Master Div., 265 Water, Ligonier, Indiana.

$10,000 PROFIT Selling Printing, Matches, Specialties! Arrow dealer tells how he did it in giant free sales outfit. You can do it too—without experience. Write Arrow Press, 521-C Fourth Ave., So., Minneapolis, Minnesota.

AMAZING Profits For You selling Sunshine Quality Christmas Cards. No investment or experience necessary. Nationally Famous 21 Cards for $1.00. Sells on Sight! Imprints, Currier-Ives, Religious, Gift Wraps, many others. Samples on approval, write: Sunshine Art Studios, Inc., Dept. PS-9, Springfield 1, Mass. Pasadena 3, Calif. (Note: East of Rockies address Springfield Office.)

CASH Commissions—Up to $10 per hour. Sell new and exclusive Ortho-Vent "Spring-Step" cushion shoes. Call on business places, industries and individuals offering them America's most comfortable shoe. High commissions, cash bonuses and exclusive repeats build you profitable business guaranteeing security. Free sales kit. No Experience Or Investment Needed. Write now: Ortho-Vent Shoe Co. Inc., Dept. PS-954, Salem, Va.

CALIFORNIA sweet smelling beads, sensational sellers. Particulars free. Mission, 2328P West Pico, Los Angeles 6, Calif.

GET New Shirt Outfit Free; make $90.00 weekly on 5 average orders a day. Famous quality Made-To-Measure dress and sport shirts at $3.95 up sell fast to all men. No experience needed. Full or part time. Write: Packard Shirt Co., Dept. 742, Terre Haute, Indiana.

IMMEDIATE Success! Sensational profits! Suits $1.75, Pants 35c, Dresses 20c, Shoes 20c. Operate from store, home, car. Free catalog. Superior, 1250-B Jefferson, Chicago 7.

MAKE Money with fast-selling Bostonian Shirts. Spare time, full time. Sales kit, actual sample fabrics. Free. Bostonian, 89 Bickford, Dept. F-11, Boston 30, Mass.

POPULAR SCIENCE OPPORTUNITIES

NEED Money? $50.00 Yours. Sell only 100 boxes New Christmas Cards. Other amazing offers. Free samples imprinted cards. Feature box assortments on approval; Free Catalogue. 100 profitable items. Work with a national leader. Write today—Pen 'N Brush, Dept. PS-9, 139 Duane St., New York City 13.

$200 WEEKLY. New Invention. Amazing 4-second Presto Emergency tire chains, fit all modern auto wheels. National advertising building big demand. 3 sales daily to oil stations, dealers, etc. make $200 or more weekly. Territory going fast. Write Presto Chain Co., Dept. P-31, Des Moines 2, Iowa.

SHINE Cars Without "Polish". New invention. Lightning seller. Cars gleam like mirror. Samples sent on trial. Kristee 60, Akron, Ohio.

FEATHERBIRD Pictures from Mexico! 100% fast, easy profits. Prompt service. Free details. Jacaman (PS-9), Box 1342, Laredo, Texas.

AGENTS—Salesmen: Sell beautiful hand colored plastic enlargements and sensational new personalized photo compacts, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline—better full time. Free sample outfit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

FREE—Big New Wholesale Catalog! Up to 50% saving for you, family, friends on nationally-known gifts, mdse: hosiery, appliances, cards, etc. Also make money selling part time! Write Today: Evergreen Studios, Box 846-AD, Chicago 42, Illinois.

AMAZING invention stops slamming, banging doors! Big profits easy with lowest priced Hydraulic door check for all type doors! 10-second demonstration sells it! Kant-Slam, Dept. M-12, Bloomfield, Indiana.

BUY Wholesale! 30-80% Discounts! Free! Large Catalog of Nationally Advertised Appliances, Gifts, Watches, Jewelry, Cameras, Typewriters, Tools, Kitchenware, etc. Start Your Own Fully Self-Operating Mail Order Business Without Capital! No Experience Necessary. Wholesale Starting Kits Furnished. Outline of Unique Automatic Sales Plan Included. Consolidated Distributors, Division 121, 21 Lafayette, Paterson 15, New Jersey.

SALESMEN—Show America's leading Nationally Advertised line—Novelties, Gifts, Utility Items. Big commissions advanced. Prospects everywhere. Steady Repeats. Low prices, free literature—samples. Write: Charms & Cain, 407-PS94 South Dearborn, Chicago 5, Illinois.

WE Start You In Jacket Business Free! Complete line of fast-selling warm leather, wool, gabardine, nylon jackets. Air Cushion shoes, too! No investment, no experience. Rush postcard for Free money-making Sales Kit. Mason Shoe, Dept. MC35, Chippewa Falls, Wisconsin.

MAKE money selling ties. Buy direct from manufacturer. Write to Philip's Neckwear, 20 West 22nd, Dept. 333, N. Y.

BIG income—full, part time. Qualify as advertising match book man—your area. Big cash commissions. Steady repeats. No investment or experience. Exclusive cover designs. Write in detail about yourself, territory desired. Maryland Match Co., Dept. M-4, 1100 South Eutaw, Baltimore, Maryland.

30,000,000 WOMEN want amazing new Automatic Refrigerator Defroster. You sell 8 out of 10 on sure-fire Free Trial. $250.00 weekly profit not uncommon. Rush postcard for guaranteed plan. D-Frost-O-Matic, Dept. T-103, 173 W. Madison St., Chicago 2, Illinois.

NEW Plastic Mending Tape. Just press on! Repairs clothing instantly. Lightning seller. Samples sent on trial. Kristee 57, Akron, Ohio.

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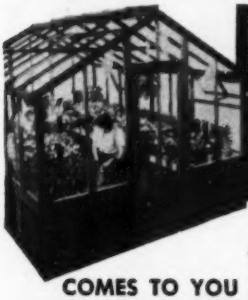

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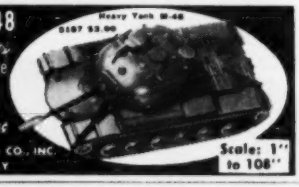

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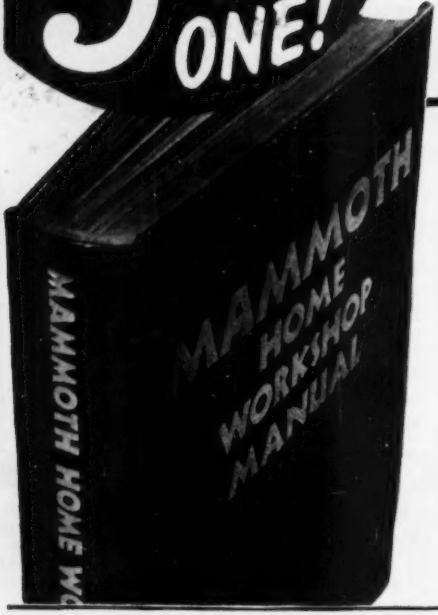

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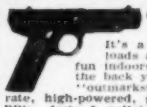

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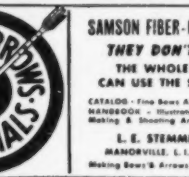

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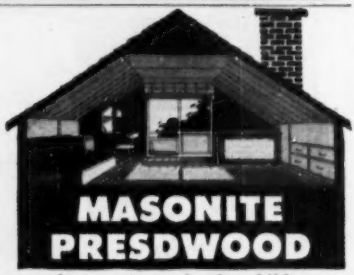

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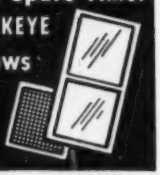

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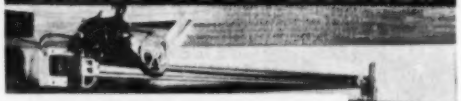

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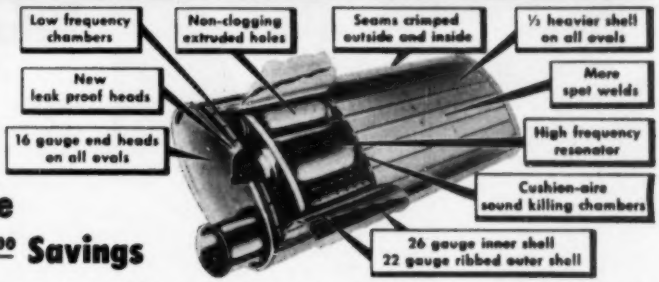

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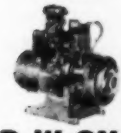

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GET A PET FOR YOUR DASHBOARD
Casco, world's largest manufacturers of car lighters—"standard equipment" in 4 out of 5 cars — brings you this exciting new idea in automatic pop-out lighters. Metal reproductions in accurate scale of America's most popular dogs in 4 rich antique jewelry finishes! Be first to have this smartly styled lighter that everyone admires!

FITS YOUR LIGHTER WELL!
This new fast action lighter is made to fit any 6 volt standard lighter well. Just pick out your favorite pet — and replace your present lighter as easily as "lighting up".

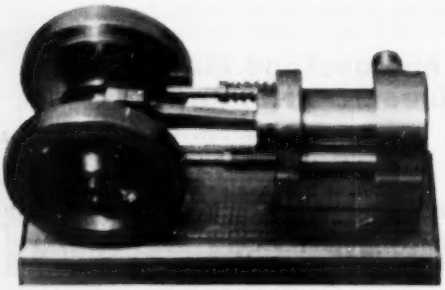
SPECIAL OFFER!
If your dealer does not yet have these new K9 lighters — send $2 and we will ship one of your choice post paid, on receipt of check or money order.

CASCO

CASCO PRODUCTS CORP. Box 3, Bridgeport, Conn.

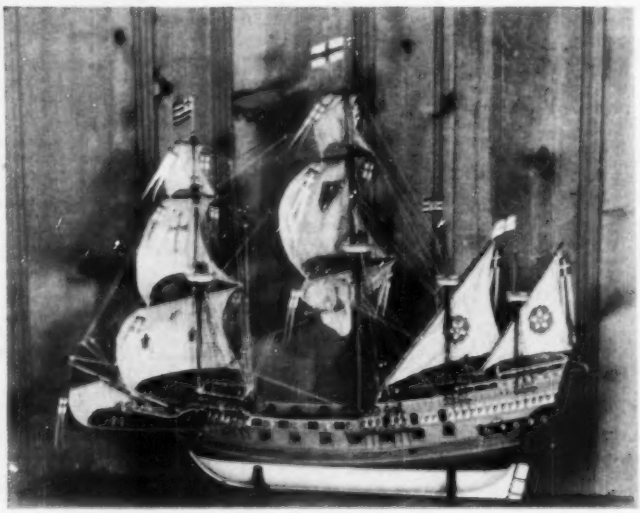
CRAFTSMEN AT WORK

Navy's Cat Has Kitten. This miniature flying boat is a scale model of the huge Navy cat behind it—a Catalina PBY-5A—even to the retractable landing gear. John J. Zeiler, an aviation machinist's mate, built the plane while at the Naval Air Station at Glenview, Ill.

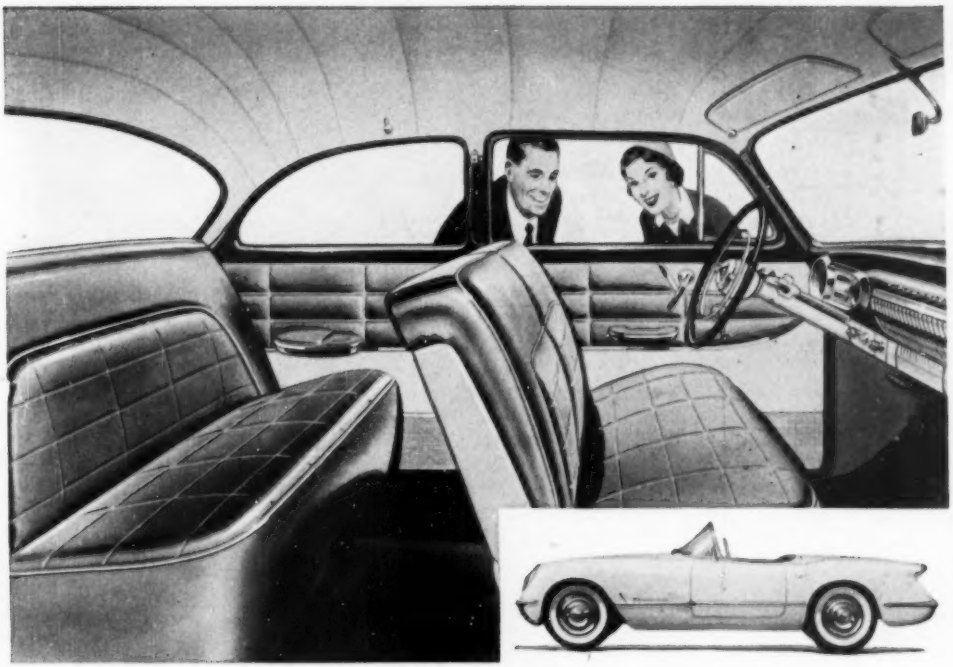


Steam Engine Has 1" Bore. Pfc. Richard T. Kozyra designed and built this engine while attending an Army machinists' school in Germany. It has a 1" bore and the piston is hollow steel. The hardened steel cams are bolted to the inside of the 3" cast-iron flywheels to operate the valves.

Wind Indicator Tells All. After reading an article in the February, 1937, issue of POPULAR SCIENCE MONTHLY, Lowell Gfell of Coraopolis, Pa., made this roof-mounted wind indicator that tells him, inside, what the wind is doing outside. The vane lights up a panel in his house to show the wind's direction, and the anemometer flashes a light at intervals that show by their frequency the velocity of the wind. Thus, a wind that blows at 15 miles an hour is indicated by 15 flashes of the panel light each minute.



***Revenge* Is Sweet Model Ship.** Two years of spare time went into building this well-detailed model of the good ship *Revenge*, which sailed some 3½ centuries ago. Otto Dumstedt of Springfield Gardens, N.Y., made every part by hand—including the many deadeyes and blocks. The eight deck guns are complete with wheels and are lashed to the deck with miniature ropes and cleats. Note the fine hand painting on the hull and sails.



Advanced Chevrolet Engineering brings

PROGRESS IN PLASTICS

for greater beauty and durability in bodies

In the new Chevrolet, dozens of body and assembly parts are now made of durable plastic materials. You see it in the three-dimensional beauty of the hood, trunk and wheel emblems. You welcome it in the extra protection a plastic bond gives Chevrolet safety plate glass windshields. And you feel its soft-textured smoothness as soon as you slide into the all-plastic interior of a Convertible, Station Wagon or Delray Club Coupe (shown above).

In these Chevrolet models you're completely surrounded by colorful, comfortable vinyl plastic. Good looking, sure; but that's only one advantage. Plastic, you know, not only lasts and lasts, but is easily cleaned if stained. Dirt usually wipes right off. The comfortable vinyl seats, practically friction free, have the smart appearance of genuine leather.

Another advantage: Soft, flexible plastics can be finished in all kinds of designs and colors. That's why these Chevrolet interiors are so inviting just to look at!

Now the Chevrolet Corvette is a story in itself . . . and an excellent example of plastic durability. The first American sports car to reach volume production, the Corvette features a body of plastic reinforced with glass fibre. Half of the plastic body shell is light enough to be lifted above your head with one hand, yet strong enough to withstand, and not even show, repeated blows from a hammer.

Your Chevrolet dealer will be glad to show you many examples of advanced Chevrolet engineering—in plastics and in other ways important to you. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

EVER FINER ENGINEERING CHEVROLET EVER FINER CHEVROLETS

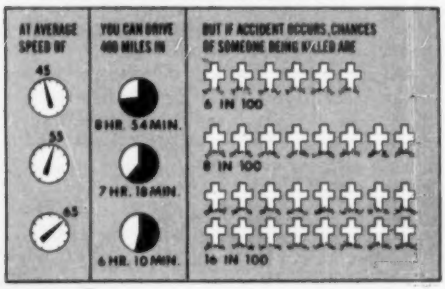
POPULAR SCIENCE MONTHLY'S • • • Last-minute news & notes

ELEVEN STATES ARE SWITCHING TO RED STOP SIGNS at crossroads. Made with a material that glows brilliantly when struck by headlights, they are said to be much easier to see...BLUE AND YELLOW TRAFFIC SIGNALS instead of the time-honored red and green are suggested by color experts of the Sun Chemical Corp. They point out that there are probably 3,000,000 drivers, afflicted with the common red-green color blindness, who can't tell Stop from Go by the present colors but could distinguish blue from yellow...IT'S OKAY TO USE FLUORINE-TREATED WATER in your car radiator, Ford researchers report. They found no harm from solutions 4,000 times stronger than those which many city water supplies use to prevent tooth decay.

A GLIDER THAT FLAPS ITS WINGS LIKE A BIRD startled Western observers at the annual Moscow air show. The Russians say, cryptically, that the wind stream raises the wings, working an air compressor which then pushes the wings back down...WIDE-SCREEN MOVIES may teach pilots to use airports they have never seen. Pan American has been testing them as a substitute for the present check-out system, which requires a pilot to test-land at each airport along his route.

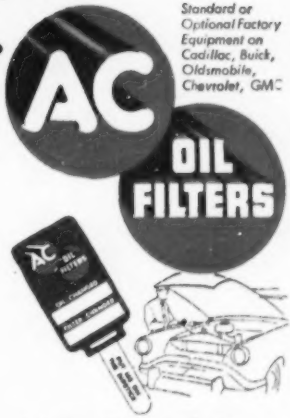
THE BEAUTIFUL RED FALL LEAVES OF POISON IVY will soon be trapping the unwary. If you do break out, you can try one of the rash of new treatments. Among them: Zotox, a zirconium ointment said to neutralize the poison in poison ivy; Prantal, a nerve drug that stops sweating and reduces itching. In severe cases, hormone shots have worked well...ONE BUILDING WILL HOUSE SEVERAL THOUSAND MONKEYS at the new polio-vaccine plant being built by Parke, Davis near Rochester, Mich.

"THE 70-MILE SPEED LIMIT has proved nothing short of legalized murder and suicide," says Dr. Paul F. Griffin in The Scientific Monthly. Documenting his charge that speed is the killer (see chart at left), he points out that the death rate on the Pennsylvania Turnpike, which has a 70-m.p.h. limit, is eight times greater than the death rate on parkways around New York City, where the top is 35 to 40.



RESCUE

your car with...



The fellow you see staring at you from this page is the new AC Sludgehound . . . symbol of the tremendously important "rescue work" which is the daily job of AC Oil Filters everywhere.

Each year AC Filters literally rescue millions of cars from the damage that can be done by carbon, grit, dirt and sludge. AC Oil Filters have actually filtered out as much as 1¼ pounds of injurious matter in 5,000 miles. So you see, *regular changing of your AC Oil Filter saves you repair bills, keeps your oil clean all of the time, keeps your engine quiet, keeps it easy on gas and oil.*

Remember the Sludgehound's friendly advice. Ask your Registered AC Dealer to check your oil filter each time he changes your oil . . . and change the filter every 5,000 miles. There's an AC Oil Filter for nearly every make of car and truck.

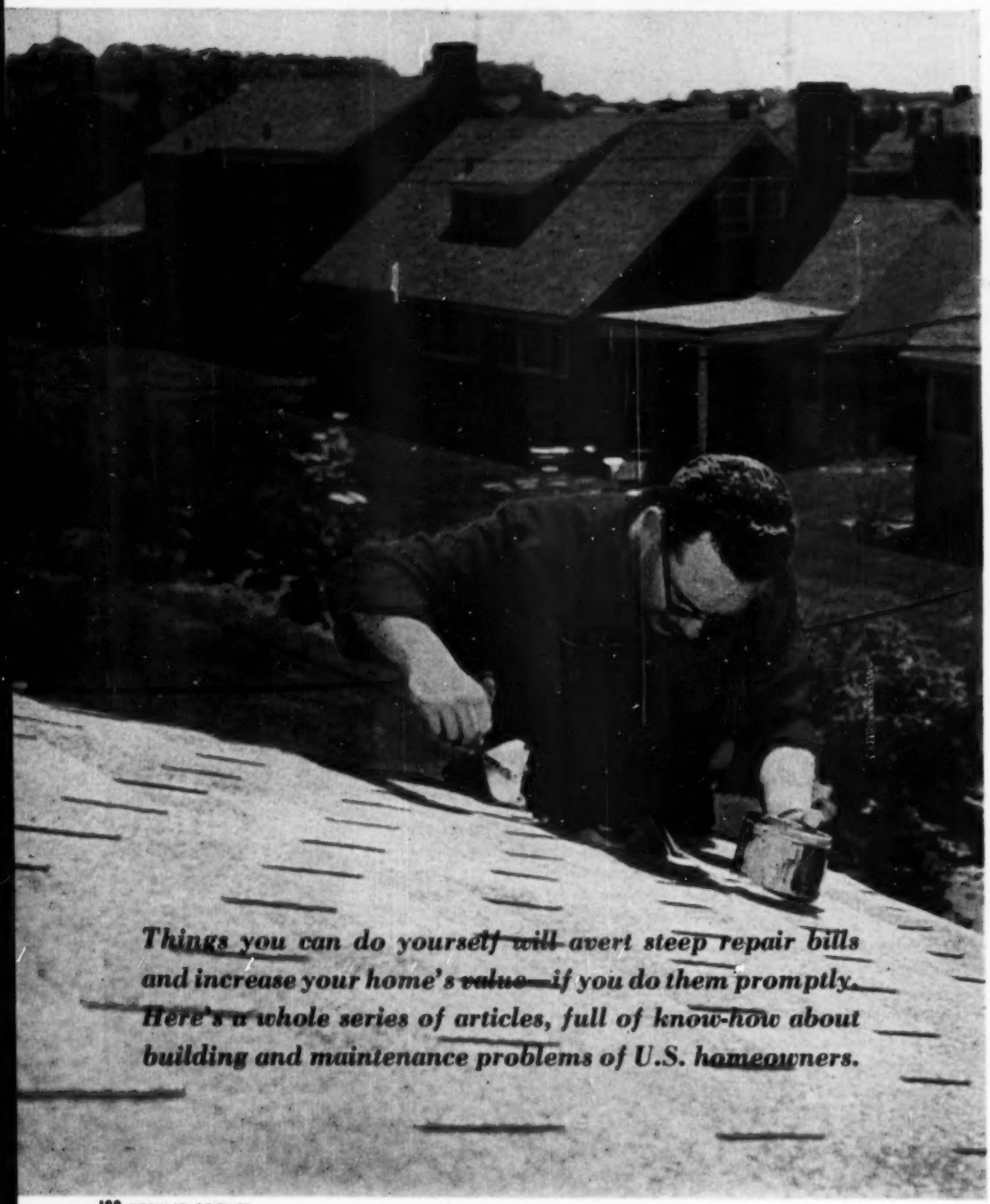
You get **10** times the filtering area with AC accordion fold

More than **90** sludge-trapping pockets are formed by this fold

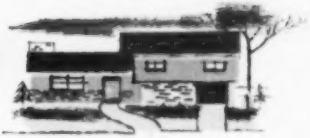
Ask any Registered AC Dealer to attach an AC metal tag to your dipstick; then he can tell you at once when oil and oil filter should be changed to give your engine the proper protection.

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

Popular Science Monthly



Things you can do yourself will avert steep repair bills and increase your home's value—if you do them promptly. Here's a whole series of articles, full of know-how about building and maintenance problems of U.S. homeowners.



How to Keep Your House Young

By Bernard Gladstone

YOUR home is the most costly and complicated piece of machinery that your family requires. Like your car, it's worth taking care of. And like your car, it needs constant attention to keep it running smoothly. By making periodic inspections and repairs—preventive maintenance, the experts call it—you can stop trouble before it starts and keep your home from growing old before its time.

Right now, before winter closes in, is a good time to take an annual tour of your house, from roof to cellar. By doing small jobs now, you can save big, expensive ones later. On the next two pages your attention will be drawn to the chief danger spots.

Equally important is keeping a good stock of repair materials on hand, especially those that can't easily be duplicated. If your floors are asphalt or other tiles, lay in an extra supply now. When you need replacements later, they may no longer come in your particular color or pattern.

Whenever you paint or wallpaper a room, save the leftovers. A daub of paint or scrap of paper will patch a crack, renew dingy switch plates or hide Junior's self-expressive crayoning without your having to redo an entire room. Special hardware, spare equipment parts and other hard-to-match items should become a permanent part of your "Fixes-I-Can't-Just-Go-Down-and-Buy-at-the-Store" Department.

Your house is like a pretty girl—it needs care to keep it from showing its age. And what pretty girl doesn't spend a good deal of time on preventive maintenance?

INSPECT ROOF once a year to spot small leaks that may cause serious damage later. Refasten loose or curling shingles by spreading roofing cement underneath. Nail metal tab under shingle, so nailhead is concealed, then bend tab back over shingle edge to hold it down.

CHIMNEY-CLEANING TRICK rids flues of dirt and soot that waste fuel, invite fire. Fill small burlap sack with sand, tie on long rope, and work bag up and down inside of chimney. This will loosen soot, let it fall to bottom where it can be removed through clean-out doors.

BUTTON UP CRACKS between wood and brickwork, as here, and around door and window frames with calking gun. They'll let moisture in, causing rot and peeling paint, and let heat out, wasting fuel. If old calking is dry and loose, scrape it out before applying new.

TERMITES love to crawl up wet piles of leaves, brush or moist earth to get into house, so keep all trash raked well away from foundation walls. Wet material lying against masonry also draws moisture up into walls, hastening wood rot and paint peeling.

GET WOOD IN EARLY so you'll have dry logs when the first snow flies. But keep main supply outdoors so termites, often living in firewood, won't have chance to get into house.

HOURS OF SCRAPING metal casement windows can be saved by using wire brush in electric drill. Remove rust, then recoat with metal paint. Reputty where old is cracked.

FREE STICKY DRAWERS with self-dispensing lubricant tube that's simply rolled along edges. If they still stick, plane slightly to increase clearance. Also wax guides and runners.

FLAT ROOFS need extra care as rain runs off slowly. Patch breaks in seams with roofing cement and recoat around vents and flashing—the most likely leak spots in any roof.

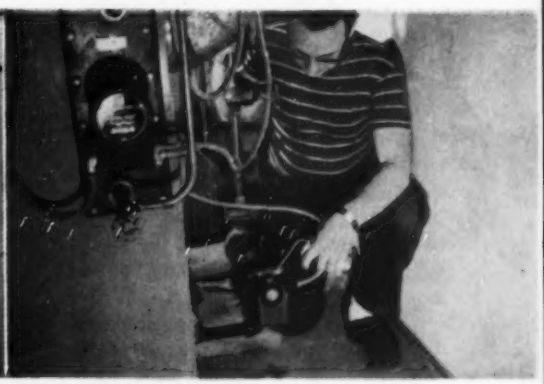
BATTEN DOWN your TV antenna against wintry winds to come. Tighten mounting bolts. If straps show wear or rust, replace them now and save an icy climb later.

CLOGGED GUTTERS may back water under roof into house. Install wire strainers to keep downspouts clear. Coat wood gutters with roof cement, metal with asphaltum paint.

SCREEN PORCHES take a tough weather beating during winter. To keep screen from corroding, coat with spar varnish or screen enamel every two years. Use screen painter—scrap of carpet on wood block—and scrub both sides. Do same for window and door screens.

ROTTED SHINGLES will quickly spread damage to other boards if not replaced promptly. To remove one without tearing off whole side, pry up edge, cut nails with keyhole hacksaw, and slide shingle out. Then nail on new one through upper shingle and along bottom edge.

BASEMENT WINDOWS are a common entryway for ants, moths, other damaging insects. You can keep them out by sprinkling liberally around frames with DDT powder. Same treatment around sills and thresholds will prevent insects from crawling under loose-fitting doors.



MAN THE PUMPS now, and save an emergency call later. Circulator pumps in hot-water systems and blowers in forced-air need oiling every four months. Renewing clogged air filters, tightening loose bolts and replacing frayed fan belts are other jobs an amateur can do.

10 Ways to Get More House for Your Money

By John L. Springer

For $12,900: three bedrooms, two baths, fancy kitchen, attached garage. For $13,990: eight-room split-level with one full bath, two half-baths, big garage, playroom, laundry. For $15,500: spacious ranch house, 46 feet long.

These are some of the extraordinary housing buys you can get in New York City's Long Island suburbs. Here builders have created modern new houses at incredibly low prices—and remember, this is an area with a severe climate and costs the highest in the U. S.

How do they do it? What secrets help Long Island pace the nation in value and volume of housing?

It's not magic, says Herman H. York of Jamaica, N. Y., architect for 46 of the Island's top developers—just hard thinking about costs, careful planning and wise use of new materials and techniques.

York believes that any builder anywhere can do the same and cut his construction costs 15 percent. Here are the 10 hottest money-saving ideas. Every one will save at least $100. Not one sacrifices quality—and some improve your house.

1 . . . use a square plan

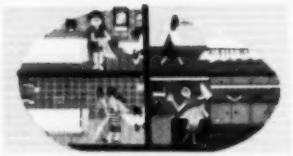
For the same outer-wall cost, a rectangular house gives more living space than a broken-up design.

Look at an average L-shaped ranch house. It is 40 feet long and 20 feet wide, plus a 12-by-12 jog for the bottom of the L. Total exterior wall is 144 feet, enclosing 944 square feet.

For the same amount of exterior wall, you could build a square house 36 feet long and 36 feet wide. This plan gives you 1,296 square feet of living space—37 percent more than the L-shape.

A simple square or rectangular plan minimizes cost of footing, foundation, exterior-wall framing and finishing, insulation, heating plant, electrical wiring and roof construction.

2 . . . keep utility lines short



Long Island's low-cost builders invariably place kitchen and bathroom next to each other. One line of water- and sewage pipes serves both. A second bathroom upstairs is placed over the first-floor bathroom so that the same lines will serve it also.

When William Levitt was building on Long Island, he used one set of lines to serve a kitchen and two bathrooms on the same floor. One bath had no outside

window and was ventilated by a fan—a plan approved by the Federal Housing Administration.

A furnace in the center of the house, near kitchen and bath, appreciably shortens hot-water and heating lines.

Architect York plans electrical outlets so that two together face into adjacent rooms. If possible, install your fuse box in a place where lines to electric range, dryer and other appliances will be short.

3 . . . save on the garage

Breezeways between the house and garage are almost unknown in Long Island development housing. Builders here insist that breezeways are expensive to build and serve no great useful function. They cut the cost of a garage in either of two ways:

They attach it to the house, so that one wall of the house also serves as a garage wall. Some use the same roof line for the garage and house, and they frame, sheathe and shingle the longer roof in one operation. They eliminate footings on garages and carry the foundation to the frost line.

Or they put the garage in the basement, saving the entire cost of an attached garage—enough, some estimate, to pay for both a full cellar and the finished playroom common in the Island's popular split-level models.

4 . . . keep roof lines straight

A roof without juts eliminates the need for different rafter cuts, and speeds framing. Gutters, leaders and dry wells all add to cost; a straight roof line reduces the number required.

5 . . . design to standard sizes

Floor joists and rafters come only in lengths that are multiples of two feet. York plans houses so that joists rest on the foundation and center girder without wasteful overlapping. This means that a typical room will be 11 feet four inches wide, taking full advantage of a 12-foot joist, after allowing for four-inch bearing partitions on each side.

Ceilings are almost always eight feet high, and walls eight, 10 or 12 feet long—so that dry-wall sheets can be used in their full sizes.

6 . . . use power tools

You'd have to look far to see a carpenter with a handsaw when a Long Island house is framed. Power lines are brought to the site and an electric saw is set up to make all rafter and joist cuts.

Power saws trim wall and roof sheathing in one-twentieth the time required in hand-sawing. Saws equipped with abrasive disks cut building stone. Power shears clip flashing and other sheet metals. Electric planes fit doors and trim. Oscillating sanders cut 75 percent from the time formerly required to smooth taped wallboard joints.

7 . . . tilt up walls

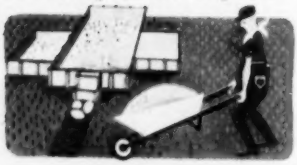
Carpenters frame an entire wall section, including notched corner braces

and openings for doors and windows, as it lies flat on the floor. Then they tilt it up and nail it to the floor. Working this way, without ladders or scaffolds, they complete a wall in 20 percent less time.

8 . . . use stock units

Windows, doors, bathtubs, staircases, all come in stock dimensions and local supply houses usually carry only a few sizes of each. These almost invariably are lower priced than those the dealers would have to order separately.

9 . . . lump similar jobs



"Long Island builders operate so efficiently because they have carefully studied the time-saving advantages of specialization," says York. Eleven separate crews are used in carpentry alone.

An individual home builder can use this technique to advantage in several ways: For example, when you pour a foundation, do other concrete work at the same time. Pour front and back steps, patio, garage floor, walks. Often, when a foundation is poured, as much as half a yard of concrete is left over and has to be dumped. If you have forms ready for other jobs, you save some of that.

10 . . use modern materials

Long Island builders take advantage of every new development in materials.

Sheet materials are now almost universally used for wall and roof sheathing. They are considerably easier to apply, in some cases save up to 50 percent on materials, and make stronger houses.

Gypsum sheathing, available in two-by-eight-foot sizes, is widely used for walls, and insulating sheathing and 5/16-inch plywood also are popular. Roof sheathing is generally 5/16-inch plywood. Many builders use half-inch plywood for subflooring. Its smooth, unbroken surface simplifies the laying of finish flooring.

In homes built to sell for less than $15,000, gypsum or other dry wallboard for interiors is almost universal. By using eight-foot ceilings, builders cover an interior wall with two four-foot panels applied horizontally, reducing the seam-taping job.

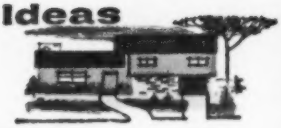
Powerful mastic adhesives bind tile to wallboard in bathrooms. This saves 20 percent over mortar-set tile. Many builders who formerly tiled four feet all around the bathroom walls now tile only around the tub. They put the saving into Hollywood-style dressing tables with built-in wash basins, and hang huge mirrored medicine and cosmetic cabinets above them.

Prefabricated chimneys, another popular innovation in houses selling below $13,000, save up to $200. One can be installed by two men in an hour and a half as against three or four man-days for a brick chimney.

Long Island builders enjoy the advantage of buying materials at carload prices, and by using the same design for hundreds of houses they keep architects' fees to a minimum. But they must pay the highest wage scales in the country, plus subcontractors' profits.

An individual can buy a set of the same plans the big operators use for less than $50. And if you do some of the work yourself, you should be able to offset their savings on material prices with savings on labor costs. By using their proved money-saving techniques, you can bring a real housing bargain within your own reach. END

New Home Ideas



How to Heat with Electricity

Glass panels wired like outlets and flipped on like lights are giving 20 New Jersey homes a new kind of heat.

INSTANT WARMTH after a chilly outing comes from this electric-glass panel in entrance hall. Panel, simply screwed to wall, is wired at back as easily as ordinary wall outlet. Tall panel here is one of several sizes that fit a wide variety of room needs.

By Sheldon M. Gallager

TWENTY families on the windswept New Jersey shore will soon begin their fourth winter in homes without chimneys. They have no radiators, no heating ducts, no furnace rooms. In fact, they have no furnaces. There isn't a coalbin, oil tank or gas line in sight, for they burn nothing.

They will be perfectly comfortable, however, in the coldest weather. For they live in Oak Park Manor, near Atlantic City, the first all-electric community in the world.

Operation kilowatt. In place of ordinary heating plants, these folks have slim, silvery panels of electrically heated glass, hung on walls as unobtrusively as well-placed pictures.

These electric-glass panels radiate sun-like warmth into rooms so evenly heated that you have to look twice to tell where it's coming from. Most small rooms need only a single panel, about 16 by 24

LATE-SEASON COMFORT OUTDOORS is easy with plug-in portable units. They warm people directly, not air, making outside heating practical. Glass-topped tea table, also electrically heated, keeps food warm for hours even when the weather is chilly.

NOT A CHIMNEY to be seen in this novel 20-home development along New Jersey coast. The estimated saving on masonry and heating plant is $1,200 per house.

"FURNACE" consists only of relay board tucked in attic or closet. There is one relay, controlling up to three panels, for each room.

FOUR SCREWS hold the heating glass in its metal back pan. The pan can be fastened to the face of a wall or recessed between the studs.

inches. An entire five-room house has six or seven.

Outside, as you walk down the quiet, immaculate streets, the only tip-off is the muted hum of high voltage. Big, black, oil-bathed transformers, affixed to every telephone pole, feed 230-volt current into each house through electric cables the size of garden hose.

Panels heat like sun. The thin glass, heated by an aluminum grid fused onto the back, throws out infrared rays much as the sun does. These warm people and objects directly, instead of the air. It's like the heat you feel when you step into the sun, even though the air temperature there is the same as in the shade. The result is an even, draft-free heat that comes on almost instantaneously.

There's no need to set up the thermostat before you get out of bed. In the morning, Pop switches on a panel in the bathroom, plugs in his electric razor, and is shaving in comfort within a few minutes—even though it may be freezing cold outside.

In the kitchen, Mom fires up her electric range, puts on the electric coffee pot, and prepares an all-electric breakfast in

front of another panel. Within 10 minutes, the entire house is warm.

A thermostat in every room. During the day, Mom can keep the bedrooms cool, the living room moderate, and perhaps a child's playroom or nursery extra warm, for each room has its own thermostat that can be set at any desired temperature.

In seldom-used areas, such as a porch or cellar, the panels can be switched on and off like light bulbs as you enter and leave.

Because there is virtually no time lag, there are no wide fluctuations in temperature. A thermostat can keep a room to within a degree of its setting.

Because no fuel is burned, there is no soot to settle on clothes, drapes and furniture. Most homes, now nearly four years old, haven't been painted or papered inside since they were built.

A panel for every purpose. On bad-weather days, Mom can speed the indoor drying of laundry with a special kitchen or pantry panel that has its own thermostat plus vents to help the circulation of warm air.

In the evening, she may keep food hot on a built-in kitchen-counter unit. Perhaps she serves supper on a heated tea table, made from one of the same electric panels. Pop, burning the midnight kilowatts in an unheated basement workshop, can carry a portable panel that simply plugs into any wall outlet.

The same portable units, moved outside, can take the chill off cool summer evenings and extend the outdoor-living season until late into fall.

How much a kilowatt, please? If you were to eavesdrop on a group of Oak Park Manor neighbors, you'd be likely to find them discussing the price of kilowatts right along with butter and beefsteak, for this is the key to practical home heating with electricity.

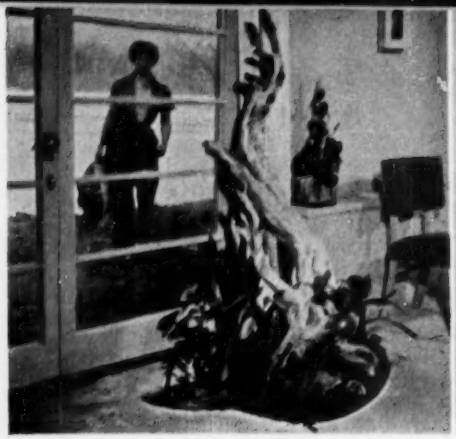
The Atlantic City Electric Co., which has been having a sale on kilowatt-hours, supplies them by the bucketload for 1¾ cents apiece. Since each standard panel consumes 1,000 watts—one kilowatt—this

[*Continued on page 268*]

KIDPROOF PANELS reach up to 300°, yet can be touched safely because of low conductivity of glass. Heat is only slightly greater at panel than across room, eliminating hot spots.

WHERE'S THE RADIATOR? Practically invisible, panels protrude less than two inches from wall. Placed under windows, they offset heat loss there, keep temperature even throughout room.

SPECIAL PANEL with its own thermostat can be turned on and off independently of room heaters for quickie jobs like drying laundry or supplying temporary warmth in unheated areas.



OUTDOORS IS BROUGHT INDOORS in the Frey house by leaving a hole in floor of ground-level basement for growing plants and flowers.

"TACKING BOARD"—soft wallboard covered with black burlap—lets Jeanne put decorative pieces on the wall without marring surface.

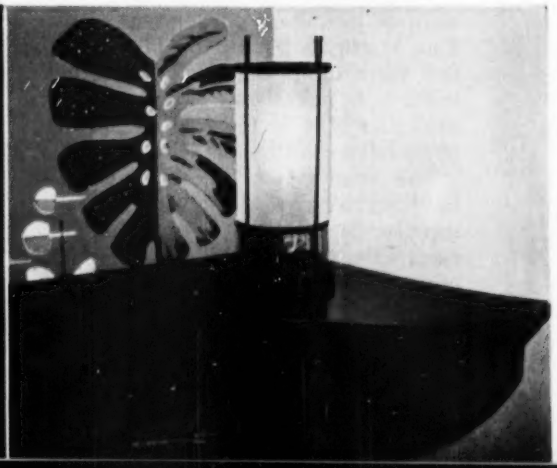
New Home Ideas

How to

Emil and Jeanne Frey didn't know a rabbet from a rasp when they started. But they had imagination, which is cheaper than professional help —and often better.

FREE-FORM DINING TABLE below shows influence of Jeanne the artist. Frey home is on Pinewood Lake, six miles from center of Bridgeport.

BATHROOM DRESSING TABLE has lamp made of two embroidery hoops and three pieces of dowel. Wall behind it was painted by Mrs. Frey.



ROLL-AWAY DESK saves room by sliding into attic wall. Bookcases on sides are built in. Some of Jeanne's art work hangs above the desk.

PIANO BENCH was designed by Freys. Tin-can lights are at right. Above Jeanne's head is a free-form shadow box for flowers, displays.

Be Different

NOBODY, probably, ever designed and built a staircase the way the Freys did. "Why couldn't we use two-by-fours on the sides instead of solid stringers?" said Jeanne. "Then we'd *really* have an open stairway."

"Well, I've never seen one like it," Emil replied, "but let's try it." That's how the two-by-four staircase came into being in a handsome house on a quiet lake in the Connecticut countryside.

If Jeanne and Emil had been two conventional people, you wouldn't be reading this

[*Continued on page 276*]

MODERNISTIC STAIRCASE consists of four two-by-fours for stringers, standard fir treads, rope banister.

LAVATORY is set into wood counter finished with waterproof wall covering. Towel holders are dowels topped by square blocks.

ONE ROLL-AWAY BED disappears completely under eaves in attic, while half of second projects into room to make a daytime couch.

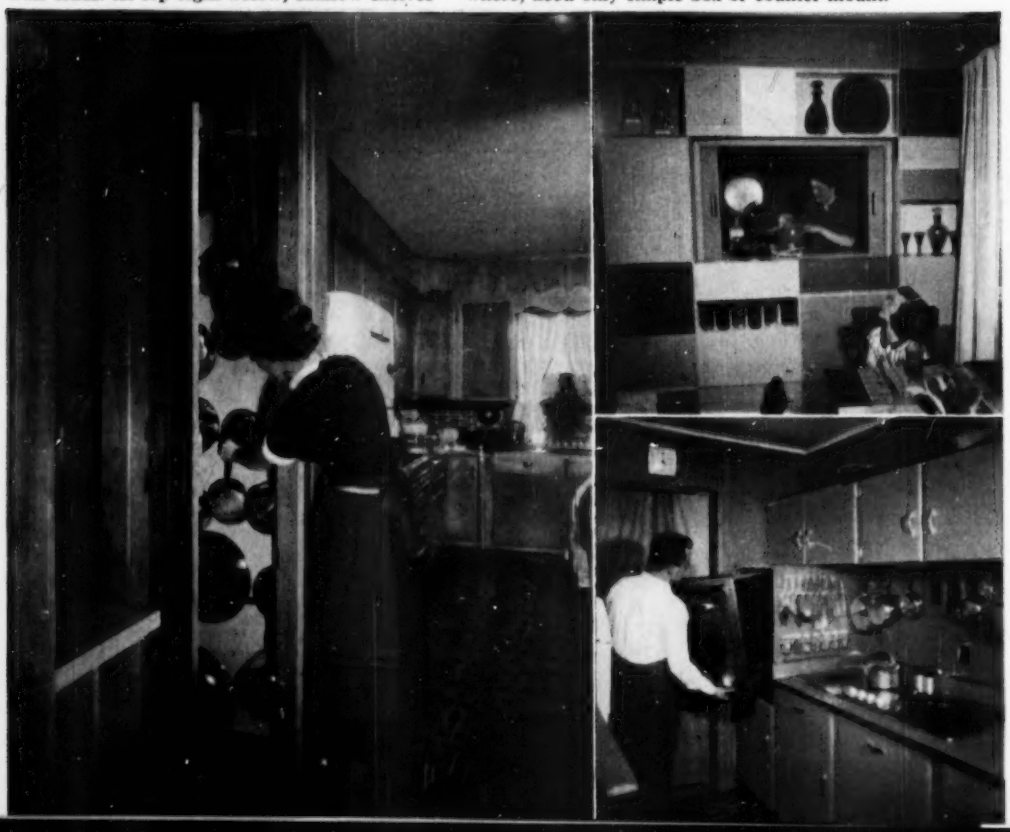
How to Build Good Kitchen Cabinets

THE kitchen is your wife's workshop. She starts out with raw material—groceries—and ends up with a finished product—a meal. How fast the job goes depends, as in any shop, on readily accessible supplies and proper tools.

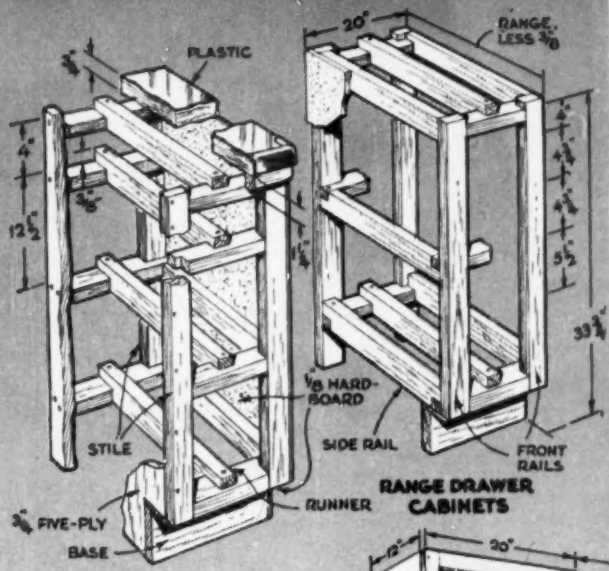
The cabinets and counters shown here are based on modern kitchen studies. They're designed to speed work by working smoothly themselves—and to keep working for years to come.

Supply areas are grouped around the major work centers, such as range, refrigerator and sink, so that an entire operation can be completed at

SPACE SAVERS like these increase kitchen capacity without stealing needed room. Cupboard at left below hides pans between two wall studs. At top right below, shallow shelves around dining-room pass-through hold cups and glasses, freeing kitchen for other storage. At bottom, new range and oven built-ins fit anywhere, need only simple box or counter mount.



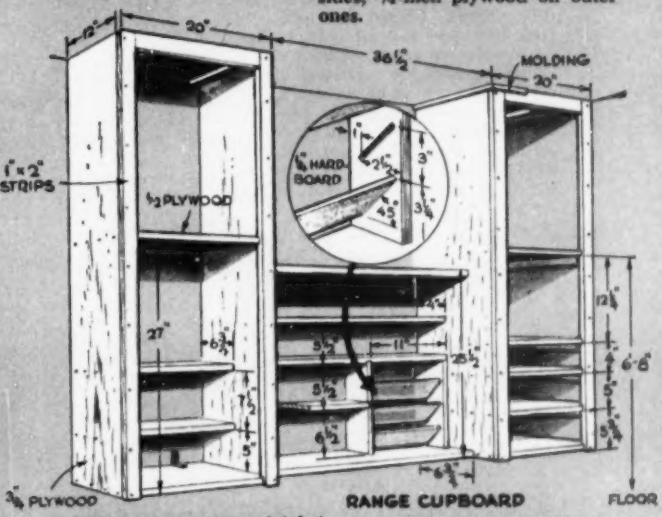
Counters and canned-food racks expand a range into a complete cooking center



RANGE DRAWER CABINETS

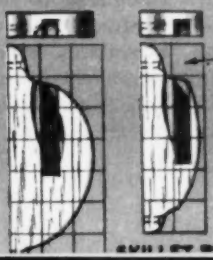
RANGE IS FLANKED by twin counter-and-drawer units that increase work space and storage. Frames (left) are made from stock one-by-two surfaced lumber, notched as shown, and glued and nailed. Use ¼-inch hardboard on inner sides, ¾-inch plywood on outer ones.

PANS ARE STORED individually in two deep cabinets over range so that each can be reached without grappling with a whole stack. Skillets are held on back of door in rattleproof brackets (sketch below). Rack for lids (sketch below right) has sloped-top dividers that roll lid knobs snugly toward rear.

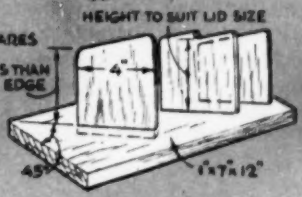


RANGE CUPBOARD

SHALLOW SHELVES (right) above range are one can deep so entire supply can be seen at a glance. Cupboards (above) are held at top by cleats screwed to ceiling and at bottom by metal angles on wall. If you can't find studs, fasten cleats and angles with toggle bolts.



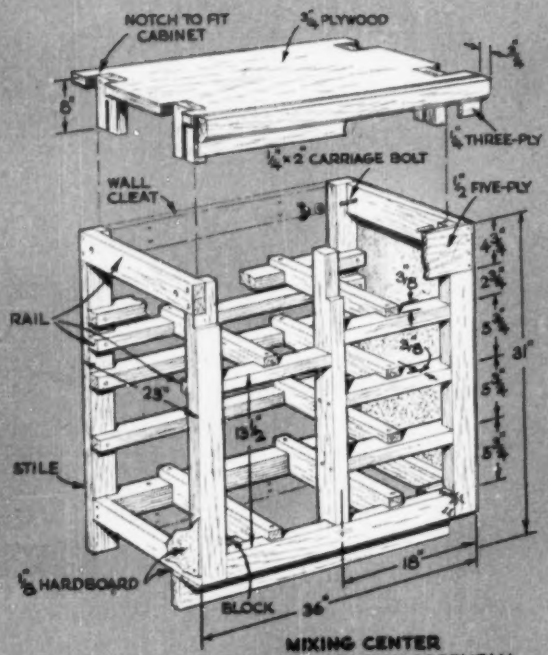
SKILLET BRACKETS



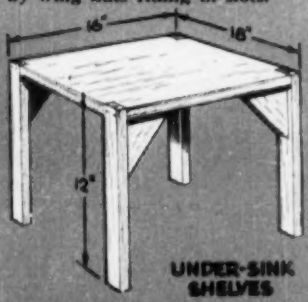
LID RACK

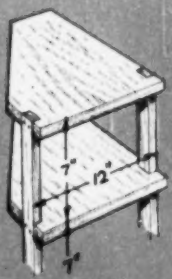
Mixing center speeds flow of food between refrigerator and sink

MIXING CENTER provides everything needed for whipping up cakes, tossing salads and preparing other foods. Placed between refrigerator and sink, it permits the housewife to reach stored vegetables on one side and wash them on the other without moving more than a step. Adjustable top on counter unit (above right) can be raised or lowered to comfortable working height, then locked tight by wing nuts riding in slots.



MIXING CENTER DRAWER SECTION ASSEMBLY



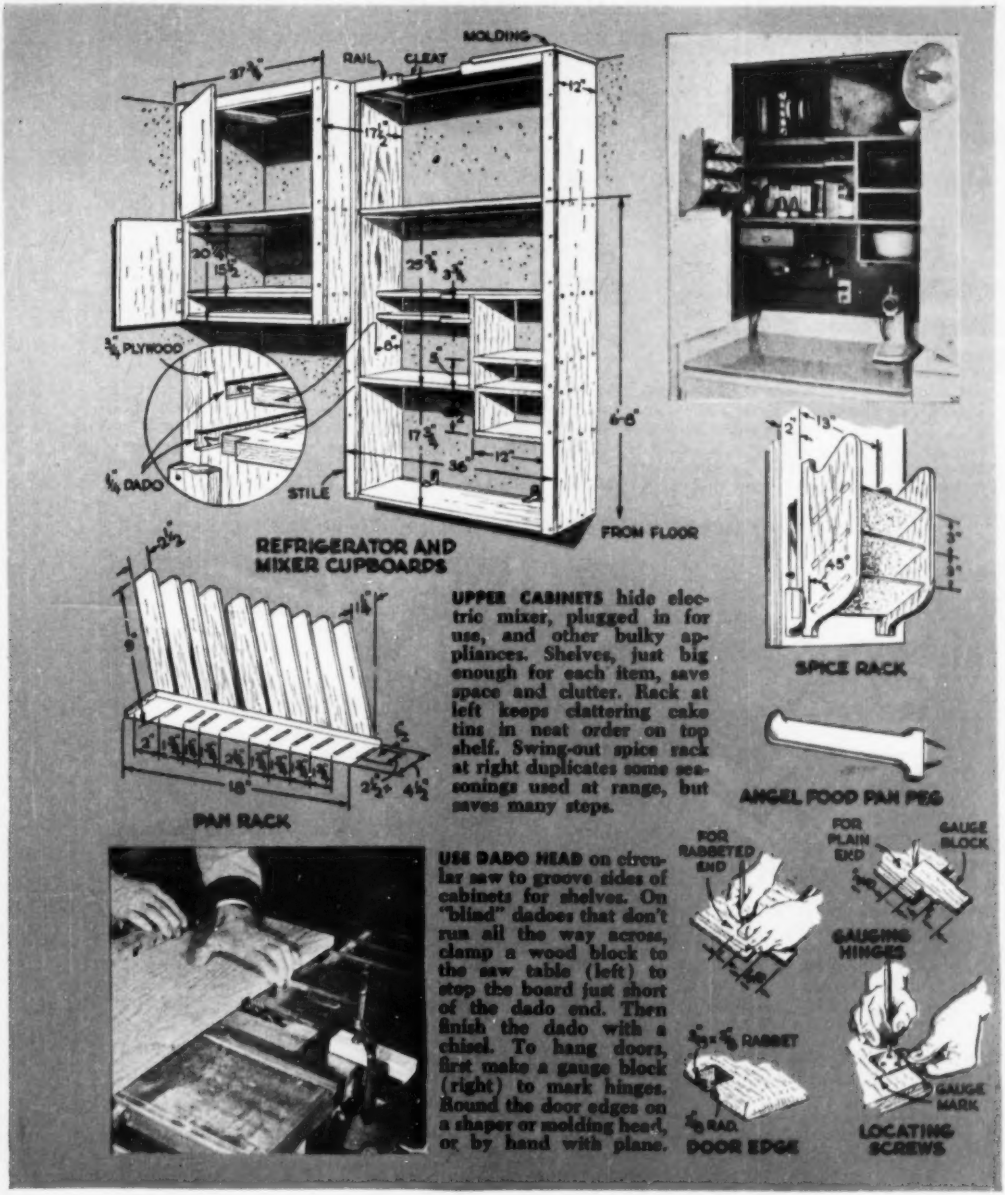


UNDER-SINK SHELVES

UNDER-SINK CLUTTER can be quickly put to rights with a couple of these easily built shelf-tables. They can be made any shape or height to sneak around plumbing pipes, slide quickly out for cleaning.

each point before moving on to the next, saving steps. Shelves are just deep enough to hold one pan or one dish, so there's no reaching over something in front to get at something else in back. Doors and drawers, built to take abuse, open and close at a touch, eliminating jams that jar even the best cook's good humor.

The cabinets are designed as self-contained units. The frame-type construction for the counters insures lasting strength, and the notched joints can be easily cut by hand. A single center runner for each drawer, unusual in



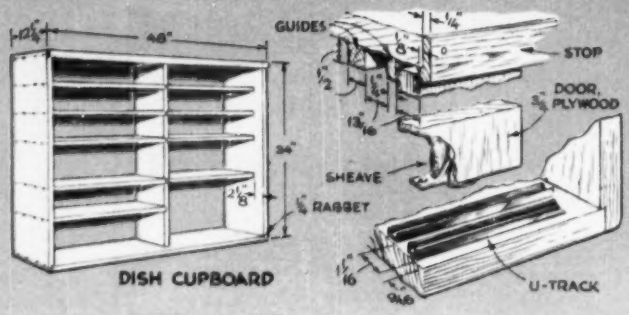
kitchen cabinets, not only does a better job of guiding than ordinary side rails, but is actually just as easy to make.

For the upper cupboards, use the rabbeted and dadoed joints shown. Plywood, a bit more costly than solid stock, will pay off in its resistance to splitting and warping in an area where heat and moisture levels are always high.

Whether you're building new cabinets or reorganizing old ones, you can adopt many of the ideas shown here to custom-tailor the kitchen shop to a real smooth-flowing production line.—*Edwin M. Love.*

Please turn the page for more on kitchen cabinets.

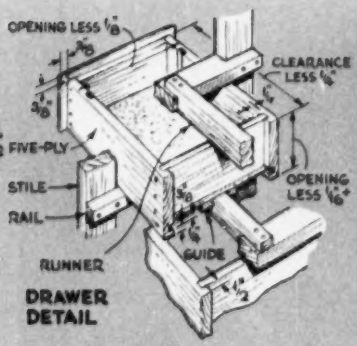
Closely spaced shelves cram stacks of cups and plates into one compact wall cabinet



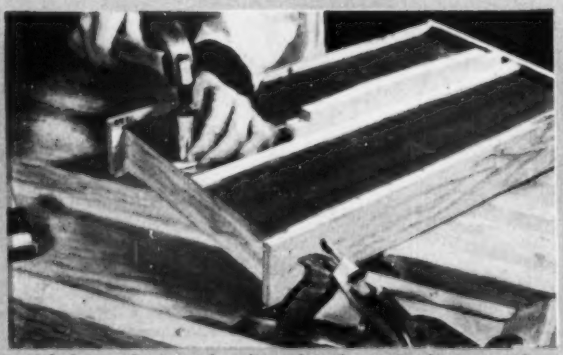
DISH CUPBOARD

DISH AND GLASSWARE CUPBOARDS can be placed anywhere you have wall space, but go best near door to dining room or over a breakfast table, which makes a good place for stacking dried dishes before putting them away. Cabinet above has recessed shelves for sliding doors, which are easier to handle than large hinged doors that swing out into the room. Rollers, riding in metal tracks, are mortised into lower edges of doors by drilling a series of holes, then cleaning out waste with a chisel. Narrow wood strips guide doors at top edge.

Tailored drawers hold utensils in easy-to-reach racks

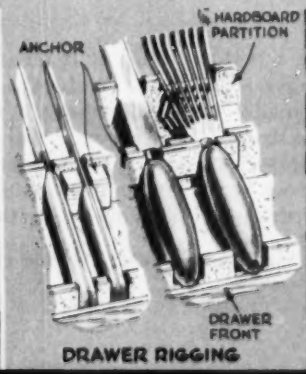


DRAWER DETAIL



DRAWERS ARE MADE of ½-inch plywood for sides and back, with ¼-inch hardboard for bottoms. Fronts are rabbeted to take sides and their edges rounded to match doors. Cut ¼-inch dadoes in sides every two or three inches to permit a flexible arrangement of partitions that can be slipped in later. To locate guides, center drawer in opening, trace pencil line on bottom along one side of runner, and nail narrow strip of ¼-inch plywood along pencil line. Then nail on second strip with piece of runner stock placed in between to gauge spacing.

ARRANGE DRAWERS so heaviest, most frequently used supplies are at top, saving stooping and lifting. Note how those at left below, for mixing counter, put large bowls high, lightweight packaged mixes low. Drawers at right, next to range, hold utensils in neat racks where they can be quickly lifted out and returned. Make racks of ¼-inch hardboard, notched to take particular utensils used. Short or odd-shaped ones that may slip off rack can be held by adding wood blocks and extra hardboard strips, as in sketch. END

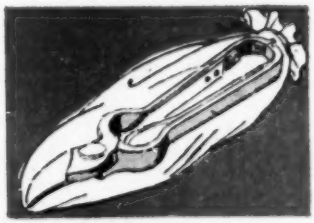


DRAWER RIGGING

KEEPING THE Yard SHIPSHAPE

USE A ROLLER and you can spread aluminum paint on your wire fence in jig time and save paint in the bargain. If the wire is not too high, you can cover both sides of the fence without moving from one side.

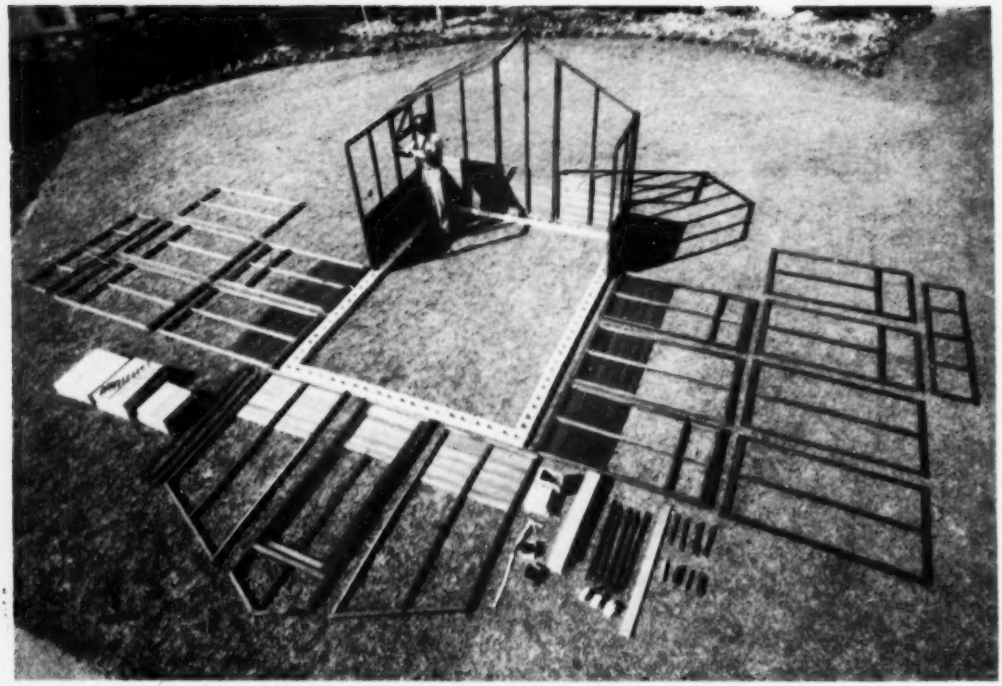
JUNKING A LAUNDRY STOVE? Detach the lower half of the fire pot, add a broiling rack and you have a fine cooking grill for the yard.



TO STYMIE RUST, store small garden tools in plastic food bags. Invest in a plastic pillow case for a big power tool.

WHEN YOU NEED A FORM to pour concrete fence posts, you can knock one together fast by slitting the ends of a six-foot length of metal gutter and nailing the spread tabs to two scraps of wood.

A PUP GARAGE on a house wall may solve your storage problems. Build it of exterior plywood on a two-by-four frame. Roll roofing covers the slanted top.



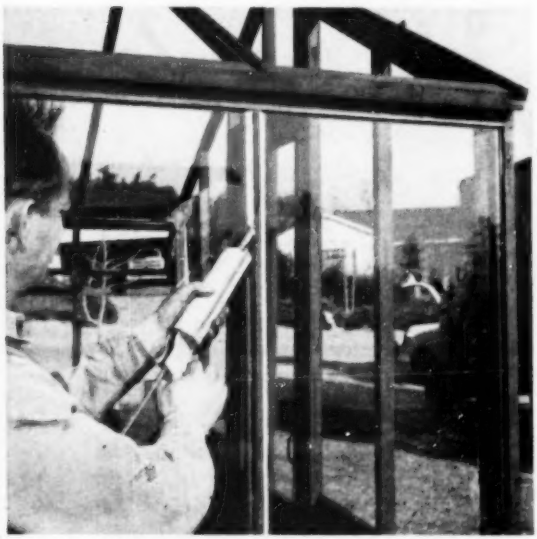
READY FOR PLANTS TODAY. Here is everything (including glass) needed to erect a 10-by-14½-foot greenhouse. Mud sill, staked to ground, can replace foundation in mild climates.

Back-Yard Greenhouses Come in Kits

PRIVATE greenhouses aren't just millionaires' toys any more. They have moved off the swank estates into ordinary back yards, where ordinary joes now can enjoy using their green thumbs all year round.

Put-it-together-yourself kits are the reason. With a neighbor's help, you can assemble one in a day. Several manufacturers now sell wood and metal kits by mail. Some have grooves that eliminate puttying the precut glass. Cost: about $500 and up.

WRENCH AND SCREWDRIVER are only tools involved in assembly. Wall and roof sections bolt together through predrilled holes. One end section contains door, already hung in place.



FRAMES ARE RABBETED for glass, which is sealed in place with kit's calking gun. This greenhouse, of prefinished redwood, is made by So. California Greenhouse Mfrs., Rosemead, Calif.

Wood Box Rolls Through Wall

I BRING my firewood in through the wall. A sliding bin near the fireplace is loaded outside, then pulled inside, saving the work and mess of lugging heavy logs in through the door.

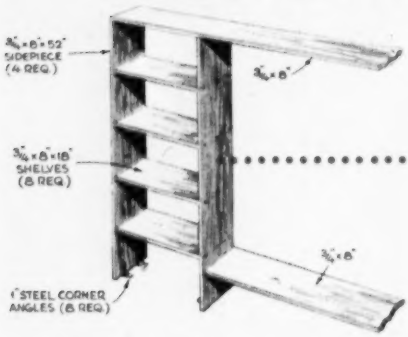
I cut out part of a stud and framed the opening. The plywood bin rides on runners, with two fixed casters under the front. My box backs into a closed porch, but on an exposed wall you could add weather strip and insulation.—*Willard Allphin, Danvers, Mass.*

Drop Tables Open for Guests

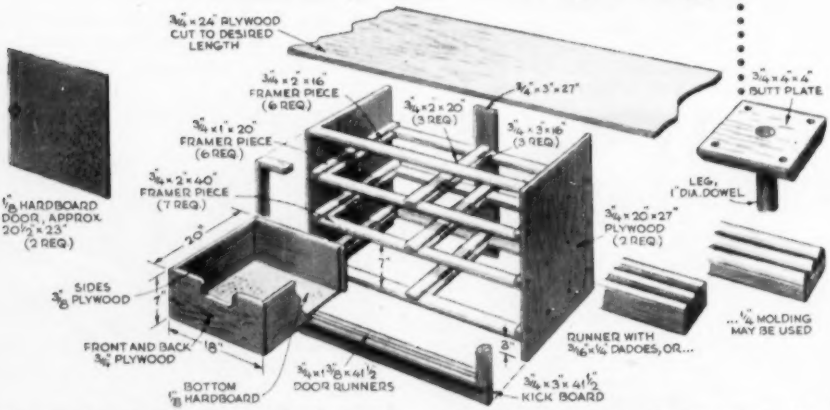
SERVING extra guests is easy with drop tables that take no room space except when they are in use. The tables are hinged to a shelf in two-foot sections, for use singly or in a long row.

The swing-out braces, hinged at the bottom, are notched to fold flat. The tops are hardboard-covered plywood trimmed with rabbeted one-by-twos.—*Hi Sibley, Nuevo, Calif.*

COVERING ENTIRE WALL around window, this study-play-storage unit has bookcases at each end (one out of photo), shelves, counter, clothes drawers (behind doors).



Take-Apart Wall Unit Has Room for Everything

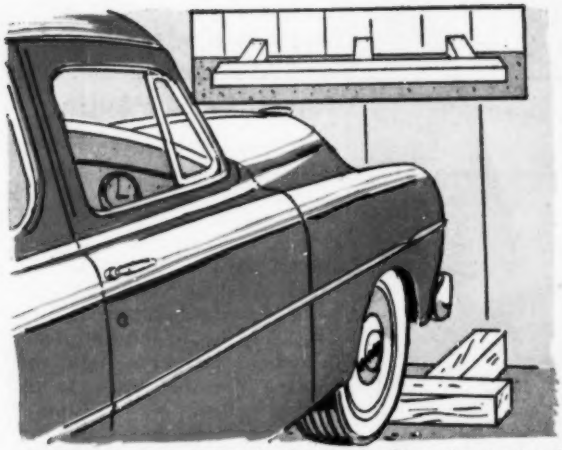


THOUGH it looks like a built-in, this combination desk, bookcase, play counter and chest is a tailored unit that can be pulled apart and set up in a new location. Its four separate parts, which can be rearranged to fit in almost any room, will absorb nearly all of a child's books, toys and clothes.

The chest sets the height of the other parts, so begin with it. Assemble the three drawer frames and screw on the endpieces. Install the drawer guides and a five-inch-wide backstop cut to the same height as the sides to help support the counter. Then add a kick board, door tracks and doors.

The counter top, long enough to fill the available space, can overhang the chest. Use one-inch dowels glued into wood butt plates to support its ends. Assemble the bookshelves as separate units on each end and fasten them to the counter with angles.—*Frederick W. Giggey, Falls Church, Va.*

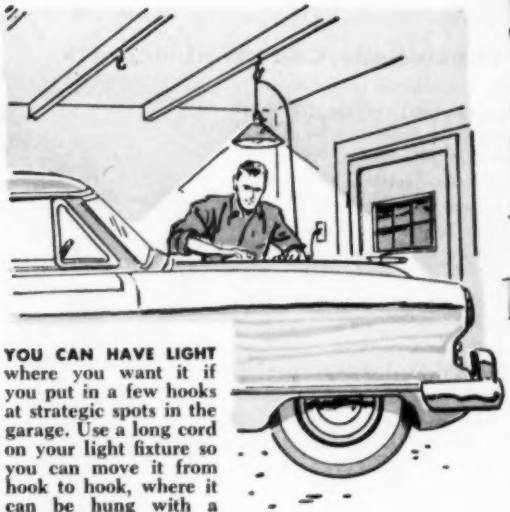
KEEPING THE Garage SHIPSHAPE



TO CURB A NEW DRIVER in the family, lay a barricade of four-by-fours and toenail it to the back garage wall. Set the barricade farther from the wall than the distance from bumper to wheels so that the curb will stop the car in time.

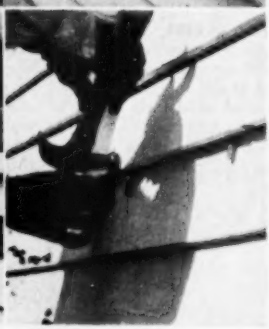
FOR QUICK CHECKS, keep a street map of your town and a road map of the state rolled up in an old window shade on the garage wall. The maps won't come off when unrolled if stuck on with rubber cement.

OLD LICENSE PLATES, pressed nearly flush into the ground, make good erosion stoppers where rain is apt to gully dirt slopes around a drive.



YOU CAN HAVE LIGHT where you want it if you put in a few hooks at strategic spots in the garage. Use a long cord on your light fixture so you can move it from hook to hook, where it can be hung with a heavy rubber band.

A DELAYED-ACTION SWITCH that turns a light off 90 seconds after you flip it is handy for an outside garage light. It will give you time to close the garage and get your key in the front door before the path blacks out.



Holes in House Walls Vent Moisture, Stop Rot and Peeling

FIRST you build a house as tight as you can, then you poke holes in it—that's the latest gimmick for getting rid of harmful moisture that may collect inside walls and cause rot and paint peeling.

In this case, a loose plank, deliberately wedged out to form a crack, allows inside moisture to get out without permitting rain and dampness from the outside to get in. The method, one of several suggested by Purdue University engineers, was devised as an easy way to vent existing houses, especially at a time when insulation is being added by blowing it into the walls through openings in the outside.

STRIPS OF SIDING are removed around house, one near roof to reach upper half of wall and one just below windows, as here, for lower half (top photo at left). Holes are then drilled into spaces between studs and fill-type insulation blown in (far left). When siding is replaced (near left), small wood wedge is slipped under each nail, holding board away from wall to form vent. Protruding ends of wedges are then chiseled off.

Glued-Up Plasterboard Won't Show Nails, Can't Warp or Crack

THERE'S barely a nailhead to show, or to patch, in this plasterboard ceiling, for there are practically no nails. Each panel is held up by flexible mastic. The cement is said to give slightly as a house settles, eliminating strain that may cause nails to pull through the board or plaster to crack. Edges, which must be seamed anyway, are nailed.

To anchor the panels, special metal plates are nailed first to studs or joists and buttered with mastic (left), which spreads through holes and forms a tight, mechanical bond. The plasterboard is then put up and held temporarily in place by fine nails through wood blocks (right). After 48 hours, the blocks are removed, leaving invisible pinholes that fill up during painting. The special anchor plates, not yet on sale, were invented by J. L. Livingston, 500 W. 164th St., NYC.

A tricky, home-built medicine chest and careful placement of fixtures help make a useful second bath in narrow, low space.

New Home Ideas

How to Put an Extra Bathroom in a Closet

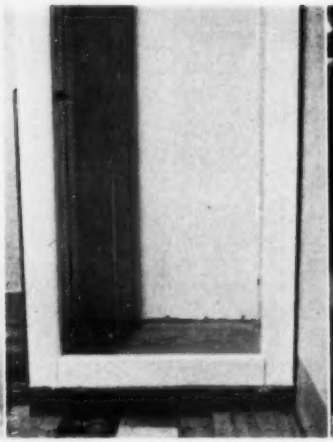
ONE reason we got a good buy on our home was its single bathroom—downstairs in a two-story house. Fortunately, a big storage closet adjoining the master bedroom sat right over the plumbing lines.

The room was big for a closet, yet still so small that it took every space-stretching trick we could think of to fit all bathroom essentials into it. A tub was out, but a stall shower would go—provided it was set on the subflooring. The radiator hides in a box recessed under the eaves. For a while it seemed that the medicine-chest mirror would be useful only to a midget—the wall at the wash-basin was just 63 inches high. By building our own chest, however, we made the mirror project from the wall and rise higher to the sloping ceiling.

The walls and ceiling were insulated and covered with plasterboard, which was finished with flexible-plastic tile. Using the same material all around made the room seem bigger. The color—an airy gray—helped, too—*Lucien R. Greif.*

Please turn the page for more closet-bathroom pictures.

TO SAVE ROOM, the radiator was recessed into a hardboard box. Note hooks that permit opening the back for access to under-eaves space behind the radiator. The box was lined with reflective insulation and given a front of perforated hardboard. This looks good, permits flow of warmed air.



STOCK STEEL SHOWER STALL could just be squeezed in under the sloping ceiling when it was set on the subfloor. The flooring had to be ripped up for the plumbers anyway. Remaining space to left of shower cabinet was enclosed for closet. Accessories were built into wall where possible, also to save room.

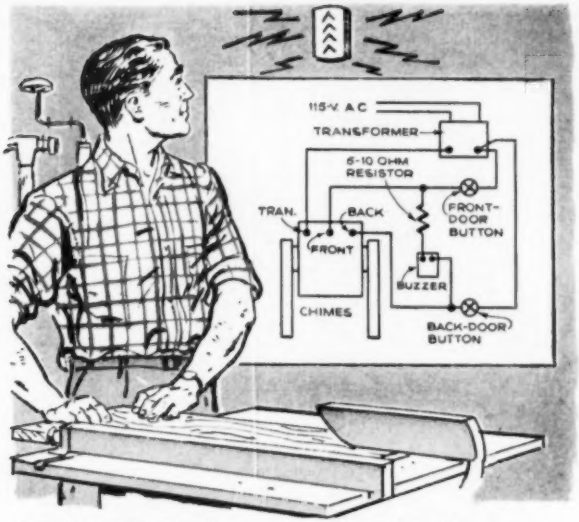
GLASS-REINFORCED PLASTIC SHEET was used to enclose the open top of the shower and prevent the accumulation of water vapor in the corner above it. The notch for the shower head was cut with a jigsaw and filed to shape (above). The material is tough, but can be worked with ordinary hand tools.

HOME-BUILT MEDICINE CABINET was mounted so that it projected five inches from wall, permitting mirror to extend up to the sloping ceiling and gain a useful height. The cabinet was of half-inch marine plywood, later covered with same tiling used on walls. Shaving light was set on ceiling above mirror.

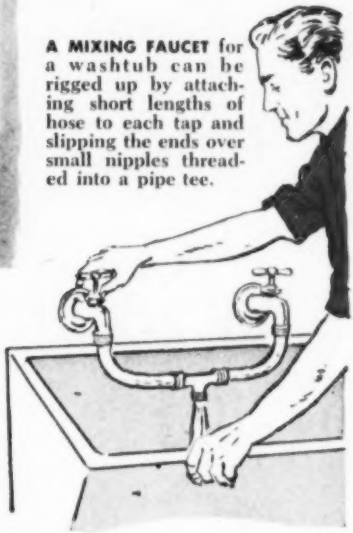
INSTALLING SPECIAL CORNER STRIPS was the first step in the wall-covering job. The strips are prescored so that they bend around inside or outside corners. Since the cement used with them is water-soluble, excess is wiped off easily with a damp sponge. Floor was later finished with rubber tile.

FLEXIBLE-PLASTIC WALL TILES were easily trimmed to fit, since they can be cut with scissors or a razor blade. A wallpaper roller served to press the seams flat, as shown above. The tiles used are made by the Bolta Co., Lawrence, Mass. They have bamboo-like texture and come in several colors.

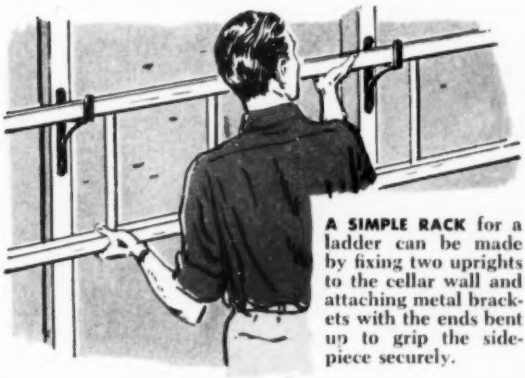
KEEPING THE Basement SHIPSHAPE



A CELLAR BUZZER will warn of callers when chimes upstairs can't be heard over noise of shop machines. Hook it up as shown, bending the buzzer armature so it is about 1/32" from the magnet core and tension is light.

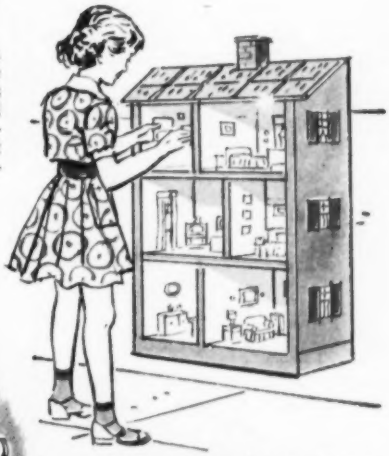


A MIXING FAUCET for a washtub can be rigged up by attaching short lengths of hose to each tap and slipping the ends over small nipples threaded into a pipe tee.

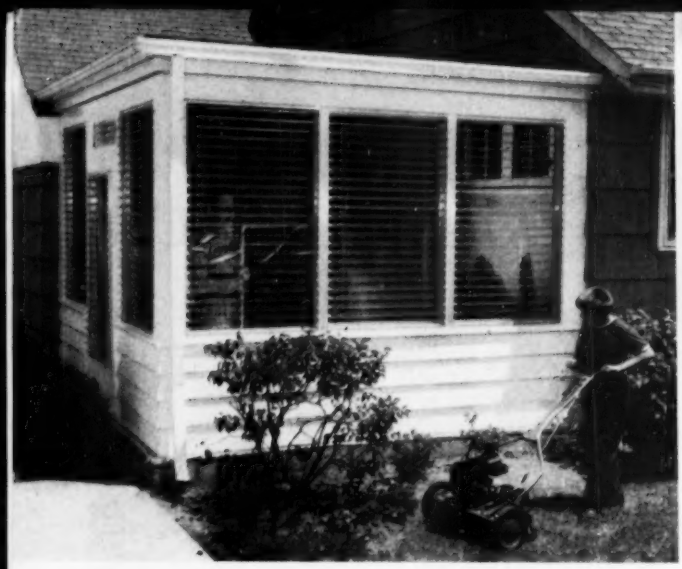


A SIMPLE RACK for a ladder can be made by fixing two uprights to the cellar wall and attaching metal brackets with the ends bent up to grip the sidepiece securely.

TO BRIGHTEN A BASEMENT, use paint outside—a fresh coat of white on the walls of window wells will reflect a lot of light inside.



A WALL-HUNG DOLLHOUSE keeps the floor uncluttered. Using plywood or hardboard, build it like a bookcase—but with partitions, windows and a slanted, roofed top. Hang it on furring strips.



NEW ROOM FROM OLD PORCH was made by enclosing open area above with kit jalousies at left. Glass slats, set to any angle like Venetian blinds, keep out rain and chill, let in air and sun, and have no frames to obstruct view. For economy—and children's safety—these are short ones set above a low solid wall.

New Home Ideas

How to Enclose Your Porch with Jalousies

GLASS jalousies—those wonderful windows that let in a breeze yet keep out a rainstorm—can now be bought by mail and put up in a weekend or two. Once costly, custom-installed luxuries, they come in semi-knockdown kits that save you about half the price.

Prefab frames, usually aluminum, are simply screwed to surrounding posts and beams, quickly converting an open porch to an enclosed, year-round room. Since the units come in literally hundreds of sizes and shapes, you can easily pick a combination that will almost exactly fit the particular space you have. Total cost for the five units shown here, including the door and screens, came to $330.—*Bernard Gladstone.*

1 **CALKING COMPOUND,** spread in several beads along upper beam and side post, will insure watertight seal when aluminum jalousie frames are pressed into it. If porch has had screens before, remove old molding strips to make flat surface for frames to butt on.

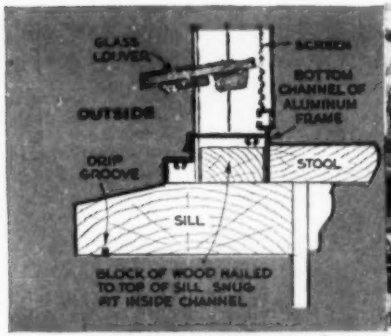
2 **SCREW FIRST FRAME** to beam at top with long aluminum screws that come with kit. Leave screws slightly loose and let lower end hang free. Working from top down this way makes it easier to fit frames, since knee wall is simply built up to meet them at bottom.

3 **MAKE SURE FRAME** is hanging absolutely level before tightening screws. If beam isn't level, slip small wood shims between it and frame. If corner post isn't plumb, hammer bottom slightly one way or other until it is straight, then screw frame to it along side.

4 TO JOIN NEXT FRAME, press aluminum mullion strip on free edge of first frame and drill holes in mullion that line up with holes in frame. Mullion clamps tightly on to make weatherproof joint between frames, will stay on temporarily without bolts.

5 BUTT SECOND FRAME tightly against mullion on first one and screw it to overhead beam in same way as previous frame. All three units—first frame, mullion, and second frame—are then fastened together with nonrusting aluminum bolts, usually supplied by maker.

6 SILL, made from two-by-six, is lifted up under frames and toenailed to posts at each end. You can cut sill, shown in following sketch, on circular saw or have it cut by lumberyard for small extra charge. Strips on top fit in channel in underside of frames.



7 METAL CHANNEL in lower edge of window slips over wood strips nailed to top of sill, making interlocking, weather-tight joint. Cut strips to make snug fit inside channel. Outer edge of sill should be sloped downward to carry rain water away from window.

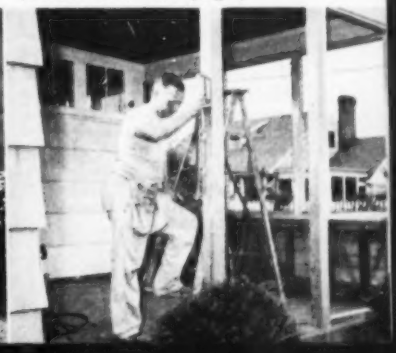
8 TO STRENGTHEN SILL, two two-by-fours are nailed to underside, forming header for knee wall. Two-by-four sole plate is then nailed to floor directly under header—drop a plumb line to locate it. End studs, also two-by-fours, are nailed next to each post.

9 SHORT STUDS, cut to wedge snugly between header and sole plate, are nailed in place 16″ apart to form frame for wall. If wall sits back from concrete edge, as here, add strip of flashing to keep water from seeping under. Overlap studs 5″, concrete 2″.

10 TO CLOSE IN WALL from outside, first nail tongue-and-groove sheathing to studs, using six-penny common nails. Rip last board to fit tightly under sill at top. Black felt building paper is then tacked to sheathing with large-headed galvanized roofing nails.

11 SIDING OR SHINGLES can be nailed on last to blend with rest of house. Prime-paint boards immediately—if possible before you put them up—to keep out moisture that would swell and warp wood. Calk joints where boards meet house and sill and at any cracks.

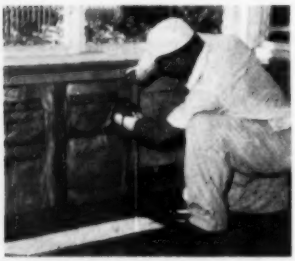
12 DOORWAY in other wall is made by installing window frame against corner post, then butting door post against opposite edge. Use four-by-fours to support heavy door, and cut to force fit between beam and floor. Plumb them carefully. *(Please turn the page.)*



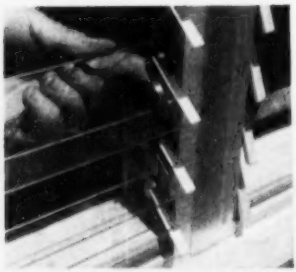
13 DOOR HEADER is two-by-four notched and nailed into posts at each side. Cut notches after posts are up to make sure header is level even if floor isn't. To notch, make two cuts with handsaw and remove waste with chisel. Locate header according to door height.

14 LAST WINDOW FRAME is fastened against other side of door, leaving small gap at wall to be filled in later. Heavy 1¾"-thick door, made to match windows, is hung with three 4"-by-4" brass butt hinges to support weight. Space above door is filled with fixed glass.

15 TO FILL GAP between last window and wall, screw one two-by-four to frame and nail another two-by-four opposite it to house wall. Using compass to copy shingle outline, saw two planks to fit against house. Nail planks to two-by-fours, one inside, one outside.



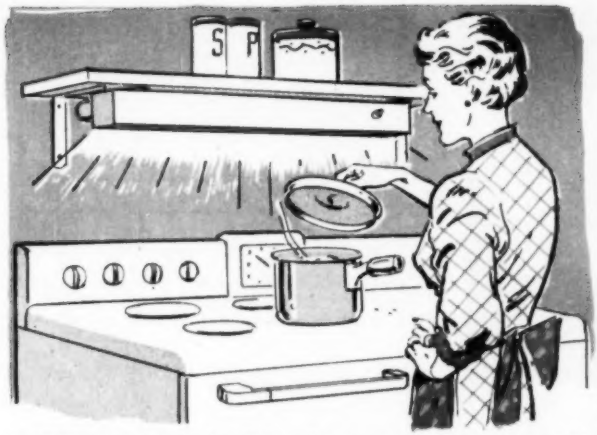
16 BEFORE CLOSING IN WALL on the inside, it's wise to add insulation now in case you may want to heat porch later. Inexpensive batts fit between studs, are simply stapled at sides. Also plan wiring and run cables through studs for any future lights or outlets.



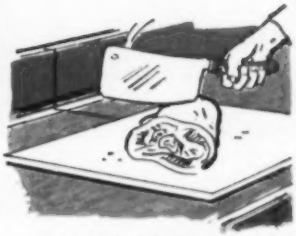
17 START PUTTING IN GLASS with few strips at top and bottom to line up holders at each side. Then, in open position, fill in rest. Small bow spring is slipped under glass at each end to lock it in holder. Springs also soften knocks, let louvers nest tightly closed.

18 LIGHTWEIGHT ALUMINUM SCREENS come with the window units. They are simply clipped to the inside of the frames and do not interfere with the louvers or control handles. In winter, metal-framed storm sash can be substituted for the screens to make your porch a year-round weathertight room. With storm sash, jalousies lose less heat than an ordinary window. Jalousie units come with either clear or patterned glass, are now available from many manufacturers and mail-order houses. Units shown here are from Clearview Louver Window Corp., 2625 Elm St., Dallas.

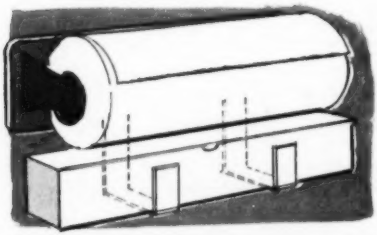
KEEPING THE Kitchen SHIPSHAPE



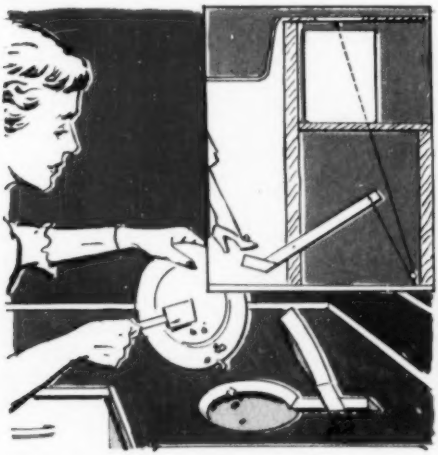
A SPICE SHELF that also lights the stove can make the cook's chores easier. Metal shelf brackets hold a narrow piece of shelving to the wall, while the light is a plug-in fluorescent unit, widely available, mounted under the shelf.



TO PROTECT COUNTER TOPS, cut a utility board from tempered hardboard. It can take the heat of canning jars, the pounding of a cleaver and the slashes of a cutting knife.

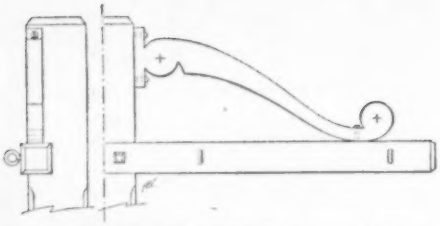


A PAPER-TOWEL RACK will hold wax paper, too, if brackets are added. Bend up two aluminum strips to fit the box and cut out two pieces in the double edge of the towel rack so that the strips will fit flush when screwed to it.

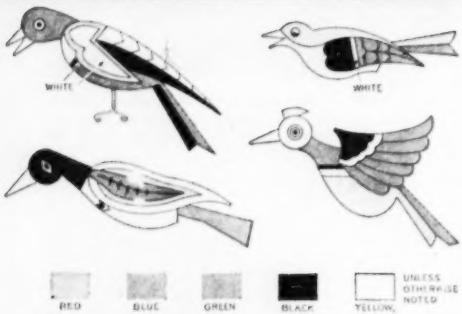


A TRAP DOOR FOR WASTE set in a work surface near the sink saves steps and back bending. With a keyhole saw, cut an opening shaped like a table-tennis bat, sloping the edges for a snug fit. The foot-pedal contraption shown in the inset sketch adds real convenience—it keeps the trap open while plates are being scraped.

A HARD-TO-REACH WINDOW over a sink is a cinch to open, even by a short person, if a sash rope with a knotted end is run through a screw eye in the top casing and then passed through three pulleys as shown in the drawing.



TWO-BY-TWO CROSSARM is recessed into a four-by-four pole. Diagonal brace can be cut with scroll or coping saw from 1⅛″ stock.



STYLIZED BIRDS, authentic Pennsylvania Dutch designs, range from 9″ to 11″ in length. Birds' legs are simply cut from coat-hanger wire.

Birds Brighten Clothes Poles

WHERE clothes poles are in almost daily use, there's a lot to be said for the sturdy old crossarm type, with each pole embedded firmly in a concrete base. They need not be an eyesore if you make them this way. Set the crossarms down a foot from the tops of the poles and cap the assemblies with ornamental braces. A zany bird, scroll-sawed from ¾″ exterior plywood and painted in the best Pennsylvania Dutch tradition, perches at the end of each brace. For legs use cut-down coat hangers, rolled at the ends to take roundhead wood screws. Swivel clips, hooked into screw eyes on the crossarms, allow the lines to be taken down when not in use.—*Henry B. Comstock.*

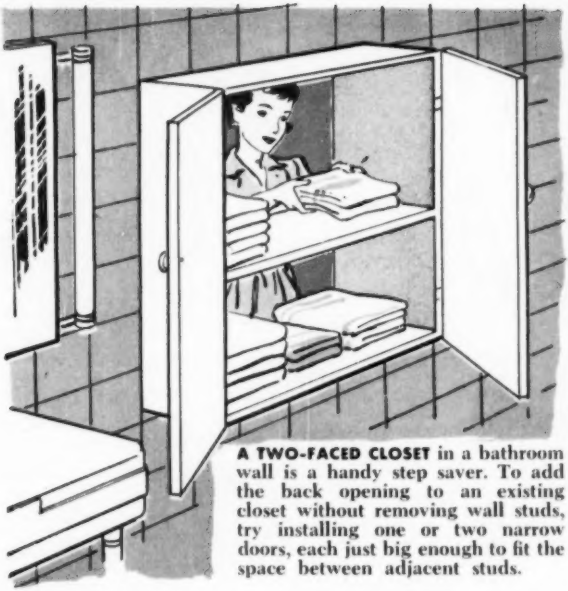
Cement Pipe Makes Lawn Roller

A SECTION of 12″ culvert pipe makes an inexpensive lawn roller. Drive a wooden bearing block into each pipe end and attach a floor flange over its center. Pass a free-turning pipe through both flanges and thread an elbow onto each end. Complete the handle with piping and elbows, halving the last—the top—section of pipe so that its two ends can be threaded into the upper elbows. Then wedge the halves together over a hardwood plug.—*Stanley B. Huested, Blauvelt, N. Y.*

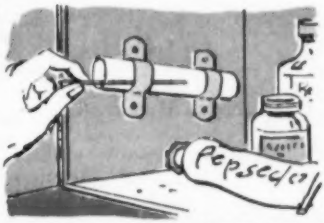
Column Holds Up Shelves, Too

WHEN a basement or large garage is to be made over into living space, what to do about those supporting posts — generally smack in the middle of the most desirable area—becomes a major problem. Charles Mongrain solved his column problem by converting it into a decorative asset. He enclosed the column with plywood and then built circular shelves of ½″ plywood around it. The lower shelf serves as an end table, while the upper one holds bric-a-brac. Pin-up lamps provide light for reading.—*E. V. Reyner, Townsend, Mont.*

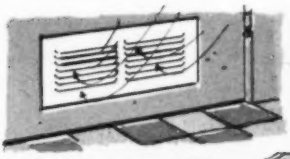
KEEPING THE Bathroom SHIPSHAPE



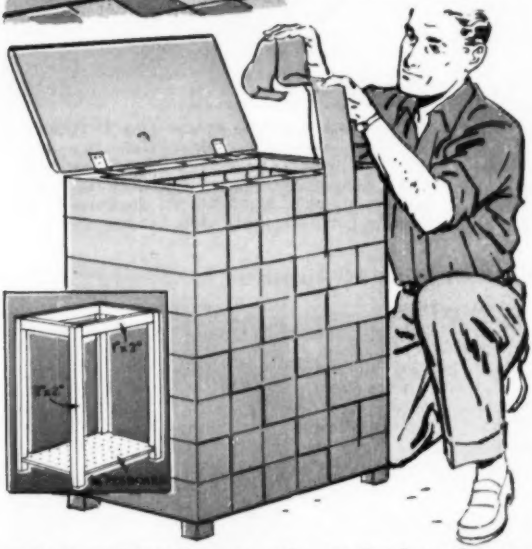
A TWO-FACED CLOSET in a bathroom wall is a handy step saver. To add the back opening to an existing closet without removing wall studs, try installing one or two narrow doors, each just big enough to fit the space between adjacent studs.



TO STORE A THERMOMETER SAFELY, use a plastic toothbrush container cut short. Fasten it inside a medicine chest with pipe straps held by self-tapping screws.

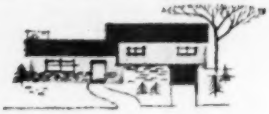


A VENTILATOR set in the door of a small room heated by hot air keeps the room warmer. Inflowing air forces cool air out through the grille.



NEED A HAMPER? You can make one fast by nailing together a light wood frame and weaving the sides of plastic webbing. Use perforated hardboard for bottom to increase ventilation. Solid hardboard makes lid.

A TRIPLE-DUTY FIXTURE for a large bathroom can be made from a wooden clothes dryer. Paint it to match the room, lay shelves of plywood across the upper rungs to hold soap and toiletries, and use the lower uncovered rungs as towel bars and laundry racks.



How to Hang Doors Faster

By Edwin M. Love

YOU don't have to call in a carpenter to hang a door now—or call out the Marines to help you hang one yourself.

Some doors now come already hung. All you do is supply the hole and nail up a frame with the door *in* it. Door kits, with all needed parts, can be assembled in a few hours. For others, simplified hardware lets you shop Saturday morning and have a door up by nightfall.

Modern sliding doors, requiring only a track to hang them from, are an easy way to partition a room or close off an alcove to make a closet. The familiar Dutch door, brought inside, will give you a toddler fence or a pass-through. And there's no reason you can't borrow the kitchen fly door for other special jobs.

You can do a lot more with doors than just walk through them—and with the types shown here, you can make the job fun instead of a fuss.

CLOTHES ARE EASY TO REACH—for the kids, too, it's plain—with sliding doors that open to full width of closet. Simple to install, they save many feet of floor space normally taken up by wide-swinging hinged doors, making it possible to place furniture close to closet.

This kit gives you a new hinged door in 10 minutes

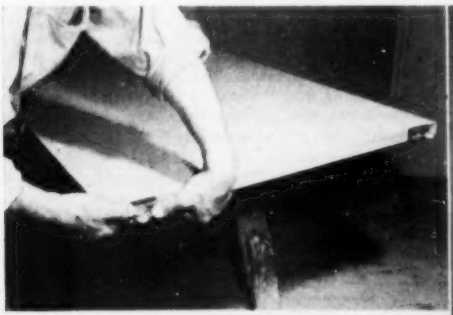
PREHUNG DOOR, frame, even decorative trim, are all combined in this two-piece package. Metal frame holding door is first fitted into opening (left), and projecting tabs are nailed to wall to hold it in place. Flush door can be natural birch or hardboard-faced for painting.

SECOND HALF OF FRAME is then fitted into opposite side of opening (right). Overlapping tabs are fastened by lock screws that adjust for wall thicknesses from 3" to 5½". These doors are made by Lott Mfg. Co., 1914 Washington St., Jamestown, N.Y.

This kit includes all the parts for sliding doors

METAL TRACK can be hacksawed to any length, is simply screwed to underside of opening at top to form upper guide. Frame the opening with one-by-five boards, shimmed level and plumb.

LOWER GUIDE is screwed directly to the floor through predrilled holes in the metal. Vertical channels at sides are fastened on in same way, flush with the front edge of frame boards.

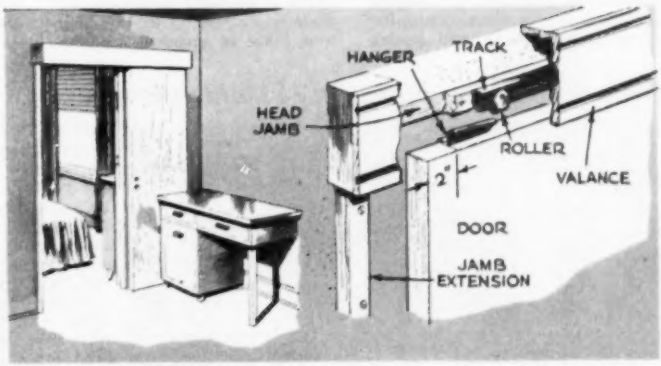


ROLLER GUIDES snap into holes in the all-steel door panels, requiring no tools. Top wheels are spring-loaded to keep doors tight; lower ones straddle track to prevent derailing.

FINISHED DOORS are simply slipped in tracks, can be quickly removed for cleaning or painting. Wood trim nailed at sides and top hides tracks. Made by American Welding & Mfg. Co., 400 Dietz Road, Warren, Ohio, the kits come for openings 3′ to 6′ wide, up to 8′ high.

This kit converts a hinged door to a sliding door

A HINGED DOOR that gets in the way can be quickly made to slide sideways with a new hardware set. Hinges and lock are removed and all holes patched with glued-in wood and crack filler. Then a valance, containing overhead track, is screwed to wall above doorway. Hangers, screwed to top of door, engage track rollers, permitting adjustment for proper floor clearance. Kit is made by Nudor Mfg. Corp., 7326 Fulton Ave., North Hollywood, Calif.



Please turn the page for more door-hanging tips.

Simple hardware makes a sliding partition easy to put in

SLIDING DOORS offer an easy way to partition off a utility room from a kitchen; a den or dining area from the living room. Door panels are simply hung from overhead track, slide along guide fins on floor. If doors wobble, screw additional wood guide strips to the floor.

OVERHEAD RAIL, made from two-by-four, is toenailed into wall studs, or can be supported at ends on two-by-four uprights held to wall by toggle bolts. Metal track is then screwed to rail, as above. Door panels are ¾" plywood or hardboard, can extend to ceiling if desired.

WHEELED HANGERS are screwed to tops of doors, which are wedged up slightly at bottom for floor clearance. Set panels plumb, then screw short guide fins, which ride in door-bottom slots, to floor where doors overlap. Slots are sawed or built up with wood strips (sketch).

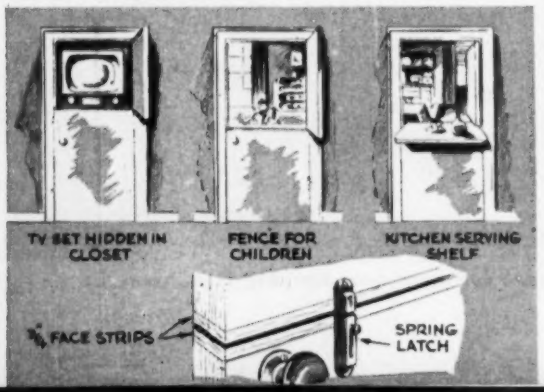
Pivoted kitchen swinging door saves fussy fitting

KITCHEN FLY DOOR is easy to install wherever a tight or locking door is not needed. Held on two pivots, the door does not require exact fitting or time-consuming fussing with locks and knobs.

LOWER PIVOT and spring are screwed into notch cut out at bottom of door. Upper pivot is screwed to head jamb and the door is slipped on it; then bottom plate is screwed to floor.

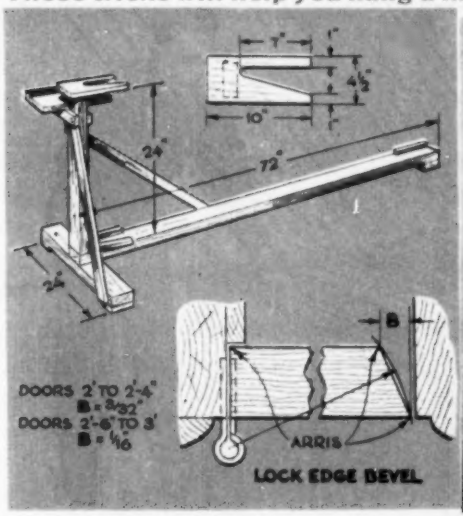
COVER PLATES, fastened over notch, hide spring assembly. Slots in base plate permit shifting door until plumb. Door should clear top and sides by ⅛", floor by ⅜" to ½".

Dutch doors have many uses inside the house



CUT IN TWO, an ordinary door becomes an attractive Dutch door for unusual interior jobs. On panel doors, saw across the center rail; solid flush doors can be cut anywhere above the knob, usually about 40" from floor. On hollow-core doors, glue and screw thin wood strips over the cut edges to conceal the core and add strength. Since this lengthens door, trim excess off ends where wood is solid. Add extra hinges at top and bottom. For one-piece operation, halves are held together by a small spring bolt.

These tricks will help you hang a hinged door



DOOR JACK holds door tightly on edge for easy fitting and hinging. Measure width of opening, then plane the door to 1/16" less on each edge. Bevel the lock edge slightly, as shown in sketch.

MARK HINGE GAINS by standing door in opening, wedged up at bottom against a 1/16" shim at top. Stab a knife blade into the crack, marking upper hinge 6" below top, lower one 10" above bottom.

USE HINGE LEAF as try square to mark length of mortise on door edge with knife. Width of mortise should be door thickness minus ¼". Also scribe depth of hinge leaf on door face.

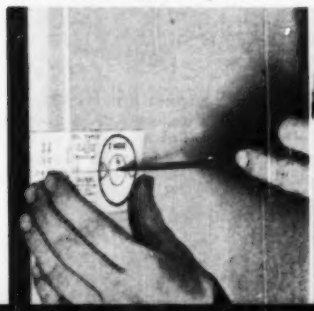
TO CHISEL MORTISE, first cross-score face from top, then come in at side to cut out chips at proper depth. Trim to end and side lines with knife, not chisel, which may crush wood.

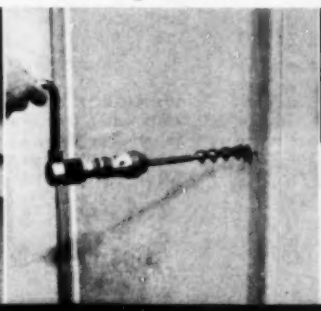
PUNCH PILOT HOLES for screws with nail set, offset slightly toward back of mortise so screws pull hinge in tight. Use small bits of cardboard to shim up hinges that don't sit flat.

MARK DOORKNOBS 3' from floor. New tubular locks are easy to install, requiring only holes drilled into door. Locate holes with template supplied and mark with sharp tool.

BORE SIDE HOLES with bit level, stopping when point pierces through. Then finish holes from other side of door to prevent splintering. Hole for bolt is drilled in edge of door.

LATCH BOLT is slipped in hole, and plate is mortised into door edge in same way as hinges. Keeper is then mortised into doorjamb, lined up with bolt, and installation is complete. END

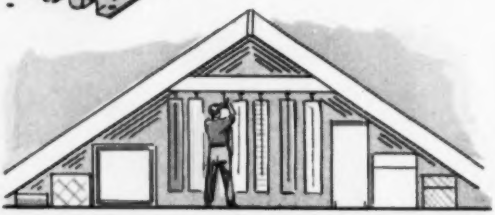




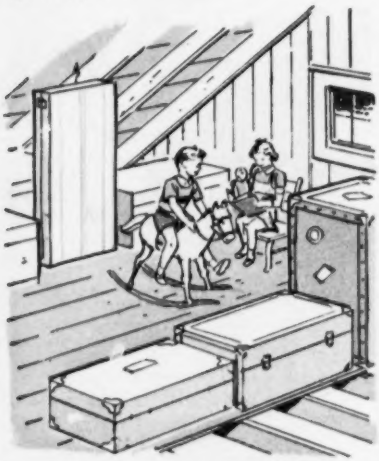
KEEPING THE Attic SHIPSHAPE

STORING AN EXTRA BED is no problem in the house with an attic. Lifted atop the collar beams it will lie flat and out of the way. If the beams are too widely spaced, lay a couple of boards across them to make a platform.

STORED SCREENS stand upright in grooves when a sheet of corrugated metal is nailed to the floor. Slide them in on their sides to fit into the little-used space under the eaves.



PLAN ATTIC STORAGE so you get the most out of the space. Hang long clothes bags from collar beam or two-by-three nailed to rafters. Arrange boxes and luggage by height under sloping eaves.



ON A RAINY DAY, there's no place like an attic. If yours is unfinished, you can still arrange a play space for the youngsters. Just wall off a cleared corner with trunks and clothes bags to keep the kids off unfloored areas.

WHICH BOX HOLDS WHAT? You won't find bathing suits when you want Christmas decorations if you label everything. Cellophane taped to boxes and marked with grease pencil can be wiped off easily for a new listing next season.

How to Modernize Your Power Supply

Even new houses rarely have wiring adequate for today's living. Here's what you can do about it.

By Elbert Robberson

FEW houses have enough electrical outlets. Most homes are full of multiple plugs that lead, almost inevitably, to overloading the circuits.

Housing experts estimate that almost every house built before 1940, and 19 out of 20 builders' houses being put up right now, are inadequately wired for our progressively greater electrical living.

More than $90,000,000 was lost last year in fires caused by using too-hefty fuses on heavily loaded circuits—or by replacing the fuse with something else.

In New York alone the Consolidated Edison Company had 200,000 customer complaints of interrupted electrical service, each one due to simple overloading.

How to find an overload. The most common symptoms of outdated house wiring are fuse trouble, snake's nests of double sockets, and extension cords used to augment meager branch-wiring outlets. If your electrical system is held together by a tinkertoy patchwork of multiple plugs, or if the lights dim as something is turned on, you're probably overloading.

But even if your house has no such symptoms, you may still be asking for trouble. Find out how much power you would need if everything in the house were turned on at the same time. You do this by taking a name-plate inventory, listing the current in amperes drawn by every article in the house, by room. Include appliances you plan to buy in the future. Current drawn by most lights and appliances is often marked on them. If it is not, the table on the next page will give you approximate figures for common appliances. If you find *watts* or *horsepower* instead of amperes, the conversion is done for you in another table on the next page.

UNDERWRITER'S NIGHTMARE —a tangle of extension cords and triple sockets—is quick tip-off to overloaded wiring. More outlets and probably more circuits are called for. Once you know what you need and where, expanding your electrical service may be easier than you thought.

How's the service? When you've arrived at your total current, check to make sure the "service" from the light pole to the house meter is heavy enough. This figure is marked on the main switch

or fuses (not the little branch fuses). The service should be at least 40 percent of your total load current, taken from the inventory.

If you need heavier service, investigate 220-volt three-wire. Having 220-volt service does not mean you will have to toss out all the light bulbs and go shopping for 220-volters. The same electrical lights, fixtures and appliances can be used, but better. The secret lies in the third wire in the service—a grounded "neutral" conductor electrically midway between the two wires carrying the 220 volts. The practical effect is to gain about twice the current capacity with just one more wire.

Maybe you need more branches. The National Electric Code calls for a minimum of one lighting branch—that's the cable that runs from fuse box to outlets—for each 500 square feet of floor space, plus a separate branch for baseboard receptacles. That is seldom enough.

High-drain devices have been brought into the living room. The combination of say a reading lamp, fan and television set will be close to the maximum efficient loading for a baseboard-outlet circuit originally intended for nothing heavier than a midget radio and a floor lamp.

The difference between the maximum *safe* current and the maximum current for *efficiency* is about 50 percent. While up to 15 amperes may be pulled through No. 14 wire without burning it up, no more than about 7½ amperes can efficiently be drawn.

Some of the new appliances need special circuits. The usual baseboard circuit just can't supply the power. Even a modest-sized air conditioner may draw 10 amperes or more. This load calls for a separate circuit with nothing else connected.

Electric ranges, water heaters, laundry dryers, radiant-heat panels and the machine-crammed shop also need special circuits.

Special circuits must be run all the way back to the main distribution box or to an extra fuse box tapped onto the main switch. They cannot be tapped into existing light or baseboard circuits.

How to get more power. Additional circuits need not mean walls chopped full of holes. If your house has its wiring in conduit pipes, additional cables can often be pulled through the existing conduit. Wiring in single-floor houses can be beefed up by running cables from the switchboard through the basement or crawl space. In kitchen or laundry it is often easy to fish cables along the path of drainpipes.

Another neat trick is to chop an overloaded circuit in two, isolating the end string of outlets. A new cable is then run from the first of the isolated outlets back to a new fuse connection at the main panel. Nothing is done to the outlets or other wiring.

Adding outlets may be easy. Even though the wiring of the circuits is heavy enough for the amperage used, you may lack holes to plug into. The Code calls for an outlet every 20 feet around a room. But people don't live that way—with one electrical gadget located neatly at each 20-foot interval.

At that spot where the TV plugs in,

[Continued on page 270]

TABLE OF EQUIVALENTS

Horsepower	Amperes
1/6	3.2
1/4	4.6
1/3	6.0
1/2	7.4
3/4	10.2
1	13.0

Watts	Amperes
25	.22
50	.43
75	.65
100	.87
150	1.3
200	1.7
300	2.6
400	3.5
500	4.3
750	6.5
1000	8.7
1500	13.0
2000	17.0

APPLIANCE AMPERAGE

Appliance	Amperes
Air Conditioner	11
Automatic Toaster	9
Coffee Maker	8
Electric Blanket	1.5
Ironer	15
Iron (hand)	9
Mixer	2
Portable Heater	10
Radio	1
Refrigerator	3
Roaster	15
Table Lamp	1
Television	3
Vacuum Cleaner	6
Ventilating Fan	1.5
Waffle Iron or Grill	9

POPULAR SCIENCE
REG. U.S. PAT. OFF. Monthly

He Builds TV Actors to Order

Bil Baird designs his players on a drawing board—and casts his shows in a carpenter shop.

By Martin Loveland

UNDER BAIRD'S SKILLFUL HANDS, the features of a brand-new character, a self-satisfied bull, take on life.

"PEOPLE," says Bil Baird, "are built all wrong for TV." They are too tall, he explains, with the result that their legs are often cut off by the bottom of the screen. Or, if a whole person is shown, his face is likely to be so small that you can't see his expression.

If you think nothing can be done about this, you don't know Bil Baird. He is rebuilding actors for TV: making them squarer and shorter so they'll fill up the screens, and giving them bigger heads, eyes and mouths so that facial expressions will register. In other words, Baird is creating puppets to replace people on TV.

"When you make a puppet," Baird says, "you emphasize the important features and de-emphasize the unimportant —shortening legs if they don't mean too

IGNORED, Scheherazade dangles limply on her 26 strings while Cap'n Scorn and Mirabelle, assisted by Clyde and Tibby Cat, enact a drama of real life half-size. That's Bil on the bridge handling Cap'n Scorn (also shown above), while Bil's wife Cora handles Mirabelle.

ANY RESEMBLANCE between Clyde and Bil Baird is intentional, for Bil says he modeled the tramp after himself. Heathcliff, a bedraggled horse, is Clyde's special pal.

much, or enlarging a mouth. You can make the puppets fit the TV screen and the script. You can't always say this about people."

Bil Baird (he says he dropped the second "l" in his first name because he never heard anybody pronounce it) already has created and owns over 1,000 puppets. It is probably the largest actors' company in existence. Not for him a career, like that of Edgar Bergen, dependent mainly upon a single character.

Mayhem in the A.M.

Every morning, in six performances on the Morning Show (CBS-TV), puppets operated by Bil and his wife Cora, with Frank Sullivan and Franz Fazakas, appear before millions of viewers. They dance, cry, flirt, strut, and sing the lyrics of songs.

FAMOUS PERSONAGES make frequent appearances on the show. Typical is easily recognizable "Abe." Clark Gable (or an unreasonable facsimile thereof) once played a cop, a bit part, in a Baird skit.

ASSISTANT MUSICAL DIRECTOR of the troupe is Humphrey the Hound Dog, here discussing records with Cora. Franz Fazakas is the voice when Humphrey pinch-hits for Charlemane.

A LOT OF WOMAN is Scheherazade, the Oriental dancer, who requires several operators to make all her parts wriggle and gyrate.

CROWN ASKEW on his mop top, Charlemane, musical director of the show, tells M.C. Walter Cronkite about the next selection, as Bil, usually out of sight, grins. King Charlemagne spelled the name differently, but Charlie (king of the jungle) likes to accent the *mane*.

Not all of the characters come out of the oblong boxes that line the walls of Bil's studio, a former coach house. Many are newly dreamed up and specially cast for new parts. Each of Baird's Morning Show numbers is about three or four minutes long, or about as long as it takes for a standard 10-inch phonograph record to play through. Such a record is always the background music, and Baird himself and his scouts are always in search of the weirdest, liveliest or most harmonious records they can get. Sample record titles they have used for numbers: *Too Old to Cut the Mustard, Take Me Out to the Ball Game, Tiger Rag, Tennessee Wig Walk,* and *The Train with the Rumba Beat* (for a show that involved a puppet locomotive that wriggled its rear—i.e., its cab.)

PRIMA BALLERINA of the troupe is Mirabelle, graceful from head to dancing slipper. Bil remade her three times to fit Cora's specifications.

A GREEN-HAIRED MERMAID, Minnie strums a mean lyre while batting her come-hither lashes.

He Gets 'Em Up and Keeps 'Em Up

Baird's acting company stages what have been called "get-up-stay-up" performances (the Morning Show is on the air between seven and nine a.m.). "This show," says Bil, "does create the habit of getting up. We get mail saying it is no trouble to rouse the family in the morning any more. We keep the music fast to keep them up."

Bil's principal character on the Morn-

THE HEADS ARE REAL—under the Dutch hats are Cora Baird and Franz Fazakas—but the bodies are worked by strings from behind the curtain. All sorts of materials go into the bodies—aluminum, steel, wood, plastic, felt, nylon and "junk," Bil's word for odds and ends.

CASKETLIKE BOXES, carefully packed and indexed, hold Bil's thousand-member players' company in instant readiness for an onstage call. No puppet ever dies; he simply gets a facelifting and goes on to another role.

COSTUMING A CLOWN CHARACTER calls for a conference with Caroline Kurze, one of Bil's assistants. Since Bil prefers materials that have been softened by washing and wear, he often dresses his puppets in hand-me-downs.

FLUTES FROM ALGERIA, a Chinese violin and something called a rundadoor are part of Bil's collection of 62 musical instruments, which also includes the organ above. Young Pete Baird likes music, can take his puppets or leave 'em.

ing Show is Charlemane, a lion, with a mane that looks like a mop, and a crown on one side of his head. Charlemane gets more fan mail than any other puppet, and much more than Baird himself gets.

Charlemane is the musical director. He introduces the records played on the show and gives bits of musical information. His stand-in is Humphrey the Hound Dog—the disc doggie—who takes over on occasion. Puppets, Baird explains, do need stand-ins. One of Charlemane's eyes wouldn't open one day recently, and he almost had to lay off—would have had to, if a patch hadn't been put over the eye.

Once Charlemane has introduced a number the scene switches to the stage, where a selected group of Baird's company puts on a skit as the record plays.

The puppets on the stage are usually marionettes. This means they are operated by strings that hang down from overhead. The operators stand on bridges about five feet above the stage and manipulate their characters by the strings. A character may require only one string—as for instance a glowworm, or a fish that has no moving parts and simply swims onstage—or he may have a considerable number. There are 26 strings on Scheherazade, an Oriental dancer who is required to wriggle a number of parts of her body. A character like Scheherazade will require several operators to handle all her strings. On the other hand, one operator can manipulate an entire school of fish.

Clark Gable and Cap'n Scorn

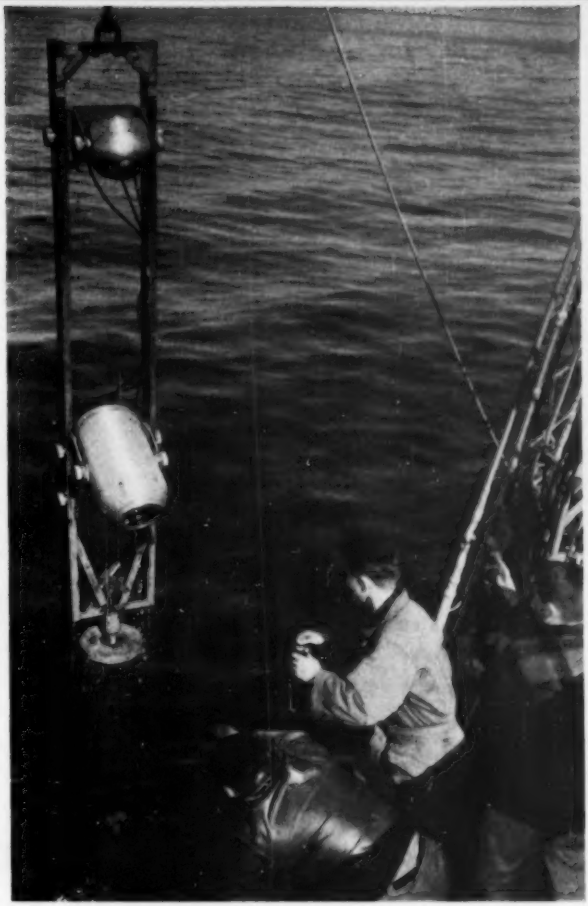
Bil's characters, who may appear often or just once, include human beings of all varieties and, besides Charlemane and Humphrey, many animals as well. He has Clark Gable, for example. Used him as a cop in one show—a minor character. This is something Hollywood cannot afford to do, Bil points out.

Bil and his wife Cora are often seen in plays or movies along with their puppets, but for the most part they and the other operators are pulling the strings or

[*Continued on page 262*]

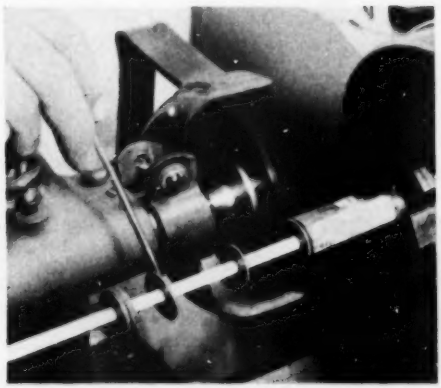
New Flash Camera Dives a Mile

THE underwater camera at right went down 6,000 feet and came up with views of sand ripples on the ocean floor. An electronic flash lit the depths as the Navy camera got the deepest shots ever taken in the Pacific.



Plastic Guards Teeth

THIS high-school quarterback grins to show a new plastic mouthpiece that brought 110 Kansas City, Kan., gridders through the '53 season without a single chipped tooth.

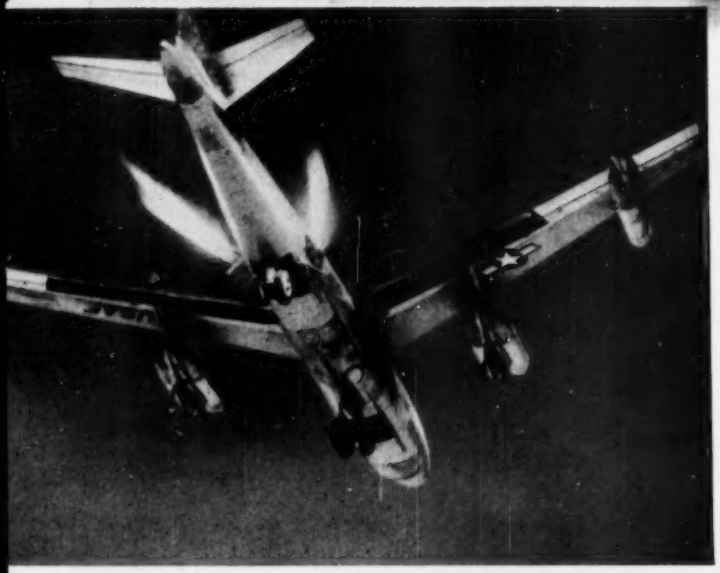


Roll Sliced into Transformers

INSTEAD of laboriously coiling wire on a spool—like thread—to make radio and TV transformers, a new method winds sheets of metal foil and paper into a roll. The roll is sliced into wafers, each a small transformer. Sylvania developed it.

Flashing Tubes Tell Time

NUMBERS form and change in split seconds on the filament of a new glow tube called an Inditron. The tubes can show the time on dialless clocks (above), flash wins on scoreboards or show data fed to tabulating machines. National Union Radio makes them.

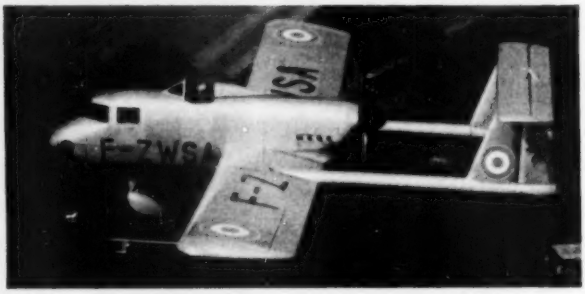


Biggest Rockets Help Jet Bomber Get Off Fast

THE biggest rockets ever designed to help airplanes take off are being demonstrated here on the B-47 jet bomber. Known as RATO (Rocket Assisted Takeoff), the power plants use a liquid propellant burned in retractable tubes extending from two apertures at the sides of the fuselage.

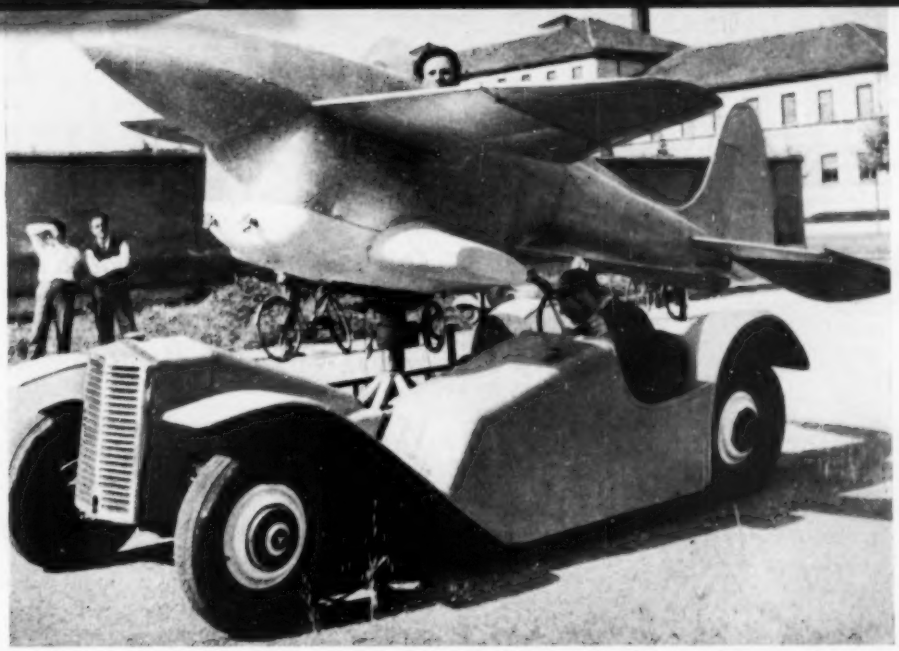
Pusher Plane Planned for Treetop Attack

A MILITARY attack airplane, with the propeller behind the wing, has been designed experimentally by the French firm of Henri Potez. Provided with a clear view ahead, the pilot flies at treetop level.



Skis with Wheels Let Plane Land on Water, Taxi Up Beach

A PAIR of these ski-like attachments for the landing gear of an airplane will permit touchdowns on airport runways, water, snow, ice or even mud. The regular wheels protrude through the skis. In landing on water a pilot "planes" on the surface as long as he has forward speed—at least 15 m.p.h. The skis, called the Universal Landing Gear, are made by All American Engineering Co., DuPont Airport, Wilmington, Del.



Plane Mounted on Car Teaches Flying Without Leaving Ground

THE airplane above will never take off with the car; nor will it fly off into the blue, leaving the automobile grounded. The strange combination vehicle is an Italian inventor's idea of how to teach the rudiments of flying. When the car is in motion, the plane above it is said to respond to controls like an airborne craft.

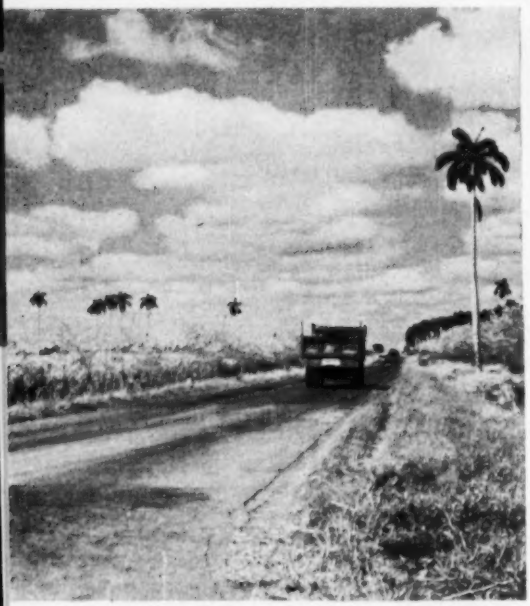
Copters "Fish" for Subs

THE whirlibird has a new job in the Navy—guarding coastal cities against submarine-launched missiles. The copters lower sonar gear into the ocean so that the crew can listen for subs. When a strike is made, the hovering XHSS-1 Sikorsky can literally stay "on top" of the quarry until carrier-based jets arrive for the kill.

Copter Welcome—on Hotel Roof

IF YOU'RE traveling by helicopter come 1955, you'll find it easy to stop at a hotel now going up in Texas. The Dallas Statler, shown in model below, will have the roof of one 21-story wing finished to serve as a heliport.

New Road to Turn



STATELY ROYAL PALMS grow abundantly in Cuba and provide a natural landscaping for many of the country's highways, such as this one, part of the Round-the-Gulf route.

STRICTLY FOR THE INDIANS who lived in Yucatan when the Spaniards took over and who, naturally, knew no Spanish, figures like that of the elephant below were used to mark streets.

Our neighbors to the south are planning a seagoing highway, 4,000 miles long, that will take you through five civilizations.

WITHIN three years, maybe much sooner, you should be able to take a 4,000-mile auto trip around the Gulf of Mexico.

The journey, with never a mile of the distance retraced, will take about a month. It will carry you through three countries and acquaint you with four civilizations besides your own.

Only two ferry hops, over waters as clear as a clean windowpane and as bright as the bluest June sky, are needed to link the encircling land areas. One will cross the Straits of Florida from Key West to Havana, a distance of 90 miles. The other will cross the Yucatan Channel from the little port of La Fe, in southwestern Cuba, to an equally tiny and quaint harbor, Puerto Juarez, in Yucatan. This is a voyage of 120 miles and will land you close to where Cortes first stepped ashore on his way to take Mexico away from the Aztecs.

Ferry Is Ready

A luxurious 475-foot vessel, the *Cuban Queen (Reina Cubana)*, equipped with two 6,100-horsepower steam turbines and able to carry 250 cars and their passengers, is now available for one of these runs.

Only three segments of highway, two of them quite short, remain to be built before you can load up and start out for a memorable roundabout ride from, say, Florida to Florida. One is a 63-mile stretch to connect La Fe with the fine Central Highway of Cuba. One is a strip of a mere handful of miles across the dead-flat limestone plain west of Puerto Juarez. One is a major section, com-

History's Vivid Pages

New vistas of tropics, and of history, will open up for the auto tourist when this route is ready.

parable in length to the Pennsylvania Turnpike, to bridge a gap of partially unexplored jungle and mountains between Campeche, Yucatan, and the Inter-American Highway, at Ciudad de las Casas.

Unlike the Inter-American Highway south of Mexico, in which three frustrating breaks are still unclosed (PSM, Jan. '54, p. 97), the completion of the Round-the-Gulf Highway doesn't wait upon financial aid from the U. S. Cuba has agreed to begin pushing her Central Highway down to the sea at La Fe. Mexico has earmarked $23,000,000 for the big job on the Yucatan Peninsula and, now that her alluring new western highway from California to Mexico City is complete, has shifted all the heavy road-building equipment across to the

VESTIGES OF SPANISH RULE, dating as far back as 1519, are frequently evident in Mexico. Few are more imposing than this splendid aqueduct, which the tourist sees near Mexico City.

southeast. Once the Cuban and Yucatan gaps are filled and the ferries are running, the land-and-water distance from Washington to Panama will be shortened by 1,600 miles. The road-building project also has evident strategic advantages in strengthening the defense of the Gulf of Mexico.

"As a tourist attraction," E. W. James, former chief of the Inter-American Regional Office of the U. S. Bureau of Public Roads, recently remarked, "the Round-the-Gulf route would be a wonder." In a speech, he explained why:

"To the observant and interested traveler, it would be like cutting a cross section of the ages. From the advanced Anglo-Saxon civilization and culture of the United States, he would pass through the Cuban development of Spanish culture and then go backward into the days of the Mayan. As he left Yucatan and entered Mexico, the process would be reversed. He would first pass through an advanced stage of Indian civilization, then through Mexican civilization, and finally return to the culture and customs of Anglo-Saxon America.

"On Yucatan's broad, flat plains," Mr. James continued, "live the last survivors of the Mayan civilization, whose ruined pyramids and cities are still to be seen. The people had reached a state of civilization which places them in some important respects actually in advance of the people of Europe in the same centuries. Before the days of the Roman calendar, they had one equally exact. They were probably farther advanced in medicine and surgery than either the Greeks or the Romans. Without a knowledge of metallurgy and knowing nothing of the wheel, they nevertheless raised structures of stone, concrete and stucco that have survived the centuries."

A NOVEL ATTRACTION that is handy to the part of the Round-the-Gulf route that passes through mountainous Monterrey, Mexico, is this cable-car railway, leading to lofty caves.

Influx of Tourists Expected

When the highway to these majestic ruins has been finished, Mexicans expect a lively upsurge in tourist traffic, as U. S. car owners are tempted down to sample the lures of Havana and Mexico City, poke through 400-year-old cathedrals, attend exotic fairs and fiestas and gaze at the wild mountain scenery.

In anticipation, the Mexican Congress has urged the government to provide easier credit for the building of hotels and motels, has proposed that a commission be set up to keep a severe watch over prices charged foreigners, and has heard some highly stimulating advice from gentle, scholarly President Cortines.

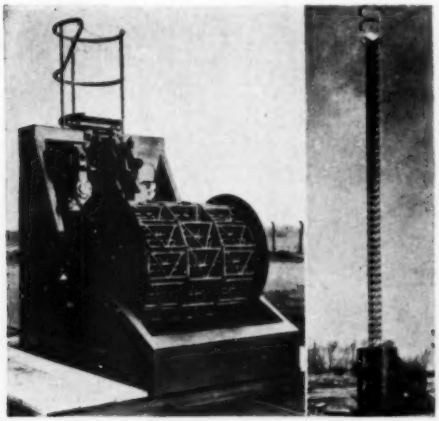
"It is unpatriotic," said Don Adolfo, "to exploit tourists."—*Wesley S. Griswold.*

This Outboard Motor Saws Wood

WHEN this fisherman comes in with his catch, his outboard motor will saw up wood to cook the fish. It is the motor of a chain saw with a boat-propelling attachment replacing chain and blade. Lombard, 36 Main St., Ashland, Mass., makes the combination.

Soldier Sneaks Up on Mines

SO THAT he will tread softly through a mine field, the British Tommy above is walking on air. Strapped to his army brogans are inflatable "sneakers" which the Royal Engineers hope will cut vibration to a minimum in the ticklish job of mine sweeping.



Tower Does Indian Rope Trick

A RETRACTABLE beam that uncoils from a drum to shoot 50 feet in the air is being tested by the Air Force as a scaffolding tower for servicing planes. The French are trying it out as a portable radar antenna.

Phone Lights Up at Night

LIFT the handset of the newest Bell telephone and the base lights up. A tiny lamp powered by a six-volt transformer plugs into the house current to shed light on the dial and the transparent finger wheel.

He Makes Hay Electrically

THE farmer above is using electricity to bale his hay. A generator on the side of his tractor supplies the power. It's an experimental "Electrall" attachment developed by International Harvester. Electrically powered farm implements, the makers say, are simpler to build, easier to control and quieter than present gasoline-driven machines.

The generator also can be used to run portable tools such as a chain saw (at left), pumps, and milking machines, or provide temporary lighting, and possibly even special lamps to stimulate a crop's growth. In some cases, the same motor can be used for different implements.

Radio Tells What Day It Is

You know what day you're facing when this clock-radio wakes you up—a calendar indicator changes every midnight. Made by General Electric, the set has a music alarm that boosts its volume if it was tuned low when it went off the night before.

...And This One Tells the Place

You know where you are when you sail the bounding main with this portable radio beside you. A combination radio and marine direction finder, it tunes in to marine and beacon bands as well as to regular AM radio broadcasts. Raytheon makes it.

UPSTAIRS OR DOWN, the view is fine. More than 90 percent of the side structure of the bus above seat level is glass. Side windows are the unlatch-and-push kind that act as emergency exits, and skylights will pop out with a good push. In photo just above, note that upper windshield is darkened at top. The bus has no true chassis but uses a stressed-skin construction.

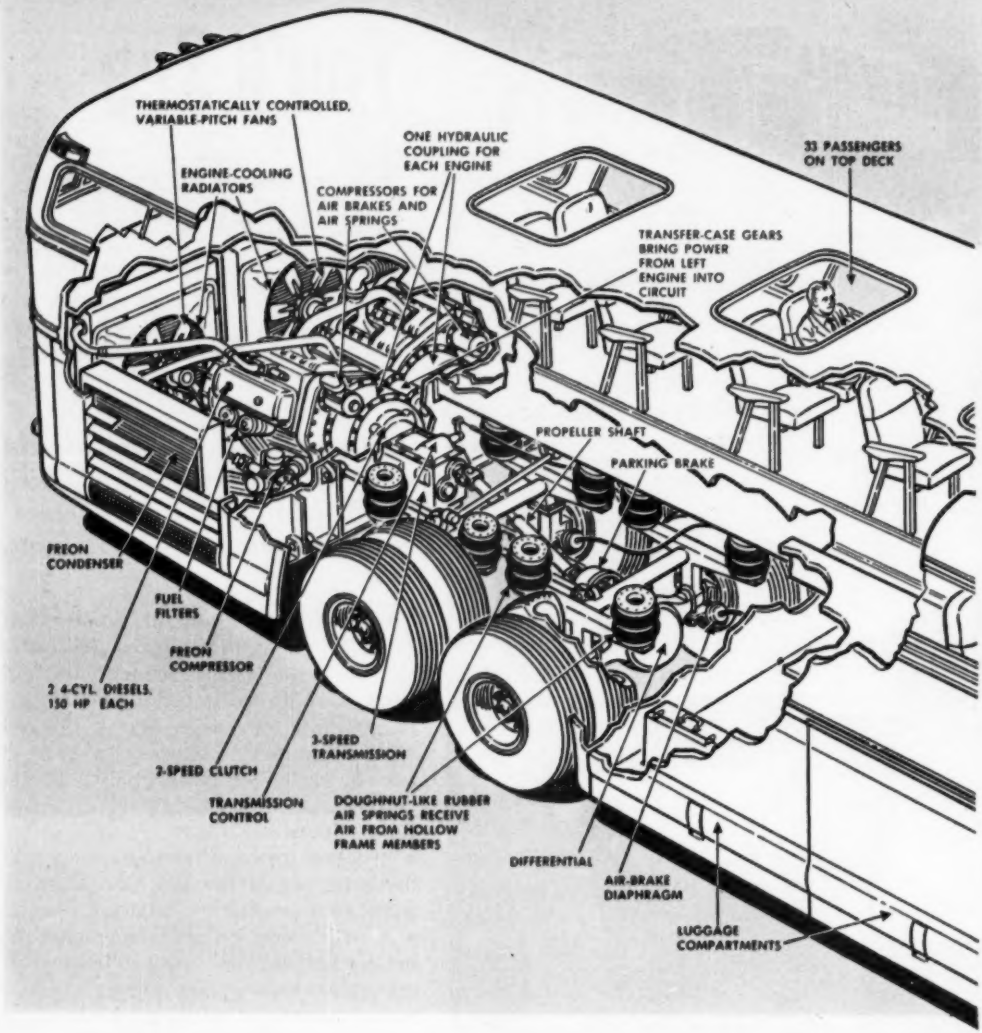
You'll See More From New Buses

Twin engines, air conditioning and a goldfish-bowl visibility give through-route travelers a plushy home away from home.

PLUNK down in one of the adjustable seats behind that big top-deck windshield. As the 20-ton "Scenicruiser" pulls away from the curb, urged by 300 diesel horses, you set out on one of the most creature-comforty highway rides in existence. It can be plausibly argued that you wouldn't be as well off in a Rolls Royce. Items:

- A potent air-conditioning system takes the sting out of the sun, and the smell from your seatmate's tobacco.
- A suspension system using nylon-rubber air bellows soaks up the bumps, and prevents careening on curves.
- An enormous area of greenish, graduated-tint glass, combined with two-story elevation, gives what amounts to a bomber-nose view of the countryside.
- A compact washroom, like those in trains and planes, offers you all the comforts of home.

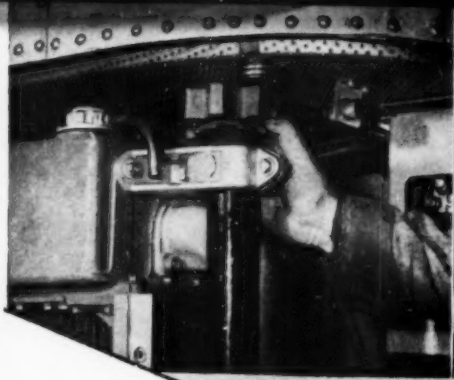
Carriage-trade bus. Five hundred of these pleasure domes, tagged at $49,000 apiece, are being built for Greyhound by General Motors Corporation's Truck and Coach Division. A special assembly line is cranking out two a day. Greyhound has scheduled them for major runs throughout the country, as part of a campaign to lure passengers from other car-

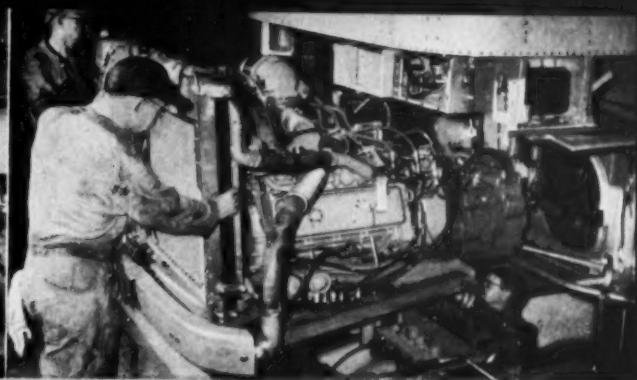


riers. This writer, taking a two-hour junket with GMC's chief inspector in the first bus off the line, found it outrageously comfortable. The only drawback, in fact, is the tendency to make you duck when the upper windshield whooshes through foliage on back roads. Company officials gravely explain that tree-nuzzling is no problem on main roads.

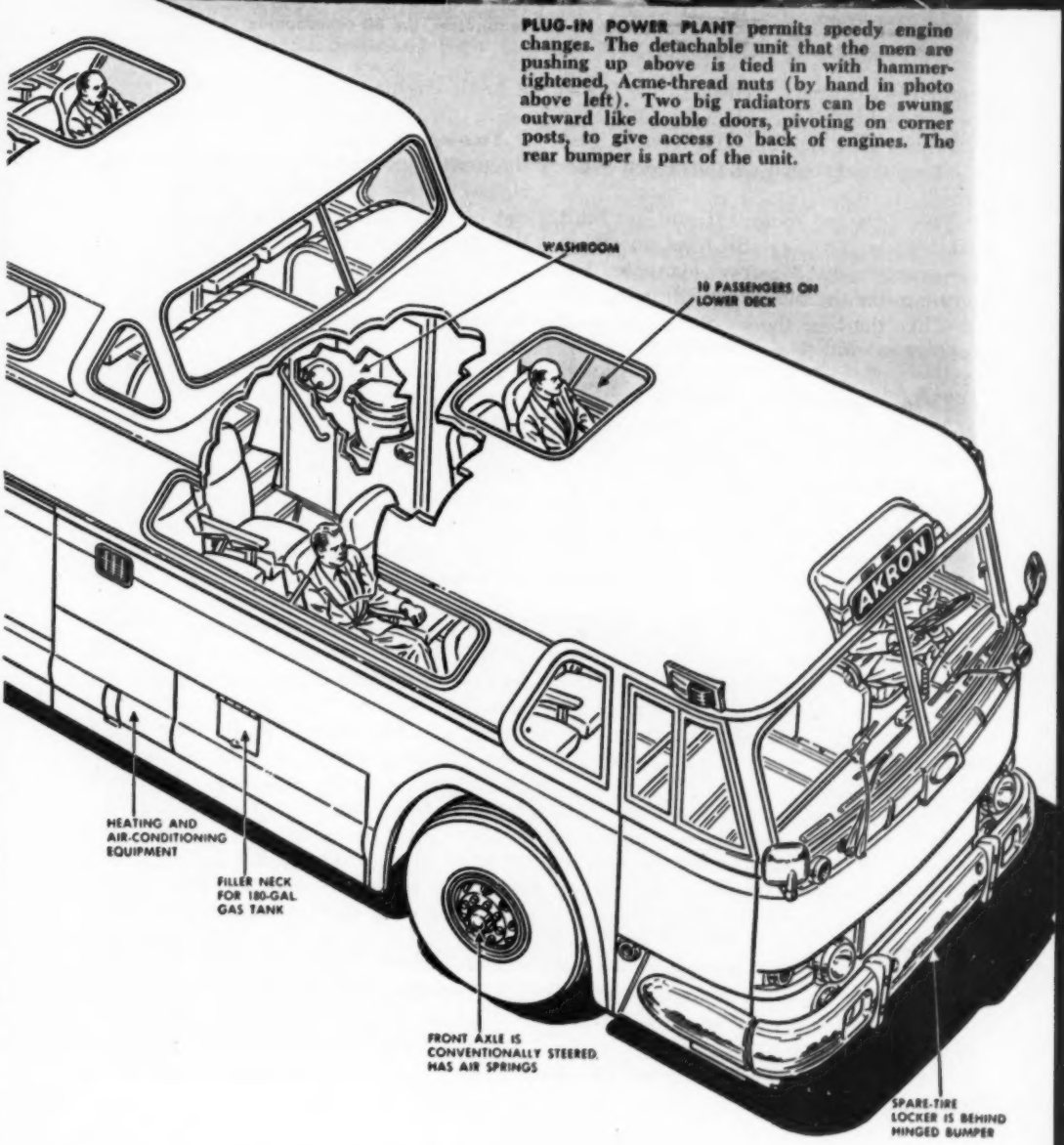
Big baby. The Scenicruiser is built out close to national maximums. She's 40 feet long, and just a fraction of an inch shy of being 11 feet high and eight feet wide. (Those fractions are deliberate: They're insurance against the chance that manufacturing variations might meet up with a persnickety highway inspector.) She tips the beam at 30,000 pounds when roadworthy but unloaded, and willingly totes a five-ton payload. This can be 43 passengers and their baggage, plus 1,500 pounds of mail and express.

The driver and 10 passengers share the lower deck, which has a tinted skylight, big windows and the washroom. Up three steps is the top deck—on both levels the seats are one step above the aisle—with places for 33 customers in

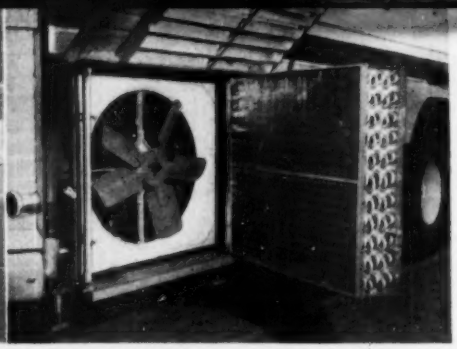




PLUG-IN POWER PLANT permits speedy engine changes. The detachable unit that the men are pushing up above is tied in with hammer-tightened, Acme-thread nuts (by hand in photo above left). Two big radiators can be swung outward like double doors, pivoting on corner posts, to give access to back of engines. The rear bumper is part of the unit.



PILOTS WOULD BE LOST with so few instruments on a twin-engined craft: oil and air pressure, coolant temperatures and a speedometer.



COOLING MACHINE uses a big condenser that swings out for servicing. Behind fan is a husky compressor for air-conditioning system.

eight rows of seats. (The last one is five persons wide.) Three skylights and large windows give a greenhouse feeling. Two electric wipers clean off the upper windshield.

The seats are roomy. If you are built extra wide you may still have an elbow campaign with a porky seatmate, but nothing like the old days. Tall types will also like the bus: there's more knee- and foot-room, and less skull-conking in the aisle.

Twin engines. The muscle is a pair of four-cylinder, two-cycle, supercharged diesels. They are mounted in a shallow vee out back, and each drives its own hydraulic coupling. Then the outputs are geared together and fed through a clutch and three-speed transmission to the differential. The driven axle is the forward of the two rear ones.

Good reasons underlie these choices. The 150-hp. diesels were picked because they were already in truck use and had proved able to clock 200,000 miles between majors. The pair together have whopping torque: about 750 pound-feet at 1,500 r.p.m.

The hydraulic couplings not only smooth out the drive but simplify the problem of persuading two engines to work in harness without throbbing. They also permit an ingenious trick. If a driver "loses" an engine on the road, he just flips a lever that pumps the oil out of its coupling into a storage reservoir. Then he can come home on the other engine. The same method of disconnection can be used at a terminal, allowing a single engine to tick over at idle, powering the air-conditioning system.

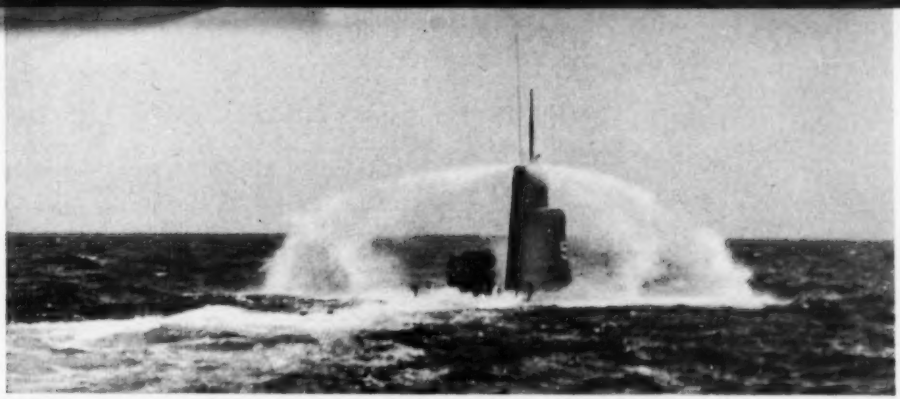
Two-speed clutch. A planetary reduction gear is built into the clutch, rigged so that the driver can cut it in or out of play at the touch of a button on the shift lever. The effect is that of a "ratio splitter" that doubles the number of gear combinations at his disposal, and reduces the number of clutch-and-lever shifts that have to be made.

From a stop, the bus's acceleration will win no green-light sweepstakes, but neither is it the glacial getaway of some current buses. Top engine speed is governor-controlled at 2,300 r.p.m. in gears and 1,900 r.p.m in direct drive—equivalent to a top of around 69 miles an hour. But it is quite possible to wheel the craft at 75 m.p.h. or better.

People whose new sedans have almost four-fifths the horsepower of this 20-ton bus may wonder why it performs as well as it does. Especially with all its power parasites: two husky air compressors, a big, three-cylinder air-conditioning compressor, a power-steering pump and a large generator. But the builders point out that it isn't really a paradox: the parasites aren't all hungry at once; the bus *doesn't* have passenger-car getaway or top speed; and its engines are worked on the payoff part of the power curve. In contrast, the engine in the sedan may spend most of its life on the foothills of its power curve.

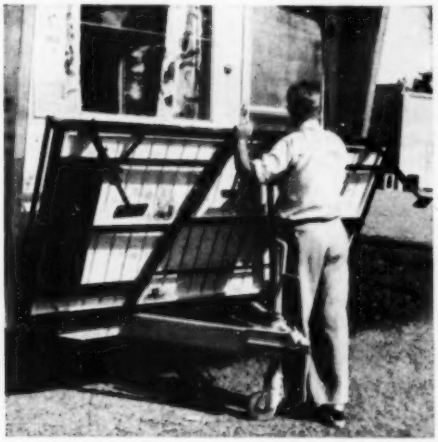
Half an hour after a sick bus limps into the shops, it can trundle out with

[*Continued on page 282*]



Thar She Blows! Snorkel Sub Clears Her Pipes in Giant Sneeze

SPOUTING like Moby Dick himself, the submarine *Tiburon*, undergoing sea trials here before delivery to Peru, rises to the surface. Snorkel-equipped subs, like whales, get water in their pipes when they submerge and have to blow it out.



Front Porch Goes on the Road

THIS trailer owner takes his screened front porch along on his travels. The floor folds back, and screens and roof are stored inside when rolling. Prairie Schooner, Inc., Elkhart, Ind., is the manufacturer.

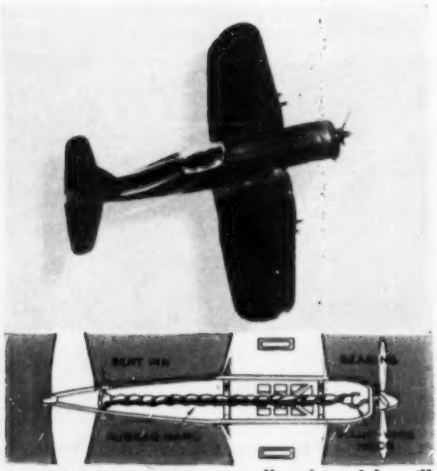
▶▶▶The baby business is still booming but marriages are way down, reports the Public Health Service. Early statistics for this year indicate more births even than the 3,971,000 of 1953, an all-time record. Most of the rise, the experts think, represents an increase in third and fourth children. Marriages, on the other hand, are fewer than last year—and 1953 had the lowest annual rate since 1933. The reason: less single people of marriageable age.

Hand Truck Climbs Steps on Electrically Powered Tractor Treads

TRACTOR treads driven by an electric motor lift this hand truck up and down steps, and even over a ramp to a truck body (above right). On the level, the wheels drop down and hand power takes over again. Elec-Truk Mfg. Co., Milroy, Ind., makes it.

Junior aerodynamicist prepares to launch his plastic model airplane on a bathtub test flight.

Teen-Ager Test-Pilots Planes in His Bathtub



WITH POWER ADDED, propellered models will climb from the bottom of the bathtub to the surface. The sketch just above shows how you can install a simple rubber-band "motor."

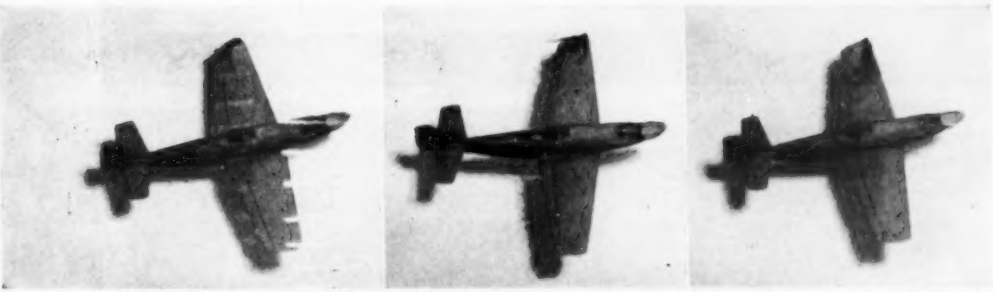
You, too, can solo without a license—it's good fun, and you will learn the facts of flight.

WIND tunnels costing millions of dollars have been built so that aerodynamicists can study the flight characteristics of airplanes. Thirteen-year-old David Raspet does a nice job along the same lines by "flying" five-and-dime-store plastic plane models in his bathtub.

To study the flow of air across a wing, David attaches a crystal of potassium permanganate to one wingtip with a smear of soap. The chemical dissolves rapidly, leaving a dark-purple trail as the plane moves along.

"Most plastic models," David warns, "must be balanced to glide through the water. The first step (unless you've got

DAVID, the son of Dr. August Raspet, sailplane expert at State College, Miss., is shown receiving instructions in the glider in which he soloed at the age of 12. That is why he knows about stalls, spins, thermals and wingtip vortex, all of which he can simulate in his underwater model-plane flights. For studying flight behavior, David gets the additional advantage of slow motion, with miles per hour of air speed reduced to inches per second of tub speed.



PROGRESS OF A BATHTUB FLIGHT. In this photo sequence, note behavior of the dark dye trails at upper wingtips. In stable flight, at left, they flow back. In center photo, the nose is rising and the trail has weakened, begun to flow inward, a sign that a stall is beginning. At right, the plane is stalled and the dye flows toward the base of the model plane's wing.

a jet job) is to cut the prop off close to the hub with a sharp knife. That will make your model tail-heavy so that it sinks to the bottom of the tub tailfirst. Smear soap or modeling clay smoothly over the nose to correct this. That's where the skill comes in. You may have to try it several times before you get the right balance.

"Before you make these tests, hold the model under water to let all the air escape. Any bubbles will move back and forth like cargo shifting around in a real plane. If your model is completely enclosed, drill a few small holes in the fuselage to let the air out."

After you have played with gliding models for a bit, you will probably begin to toy with the idea of underwater powered flight, as David did. To do a power-conversion job on a plastic model, you need one that has a propeller attached to a spinner or hub. Install a small thrust bearing on the spinner and drill it for a prop hook of piano wire (see drawing on page 156). Then thread a double strand of rubber band through the fuselage, hooking it at the rear.

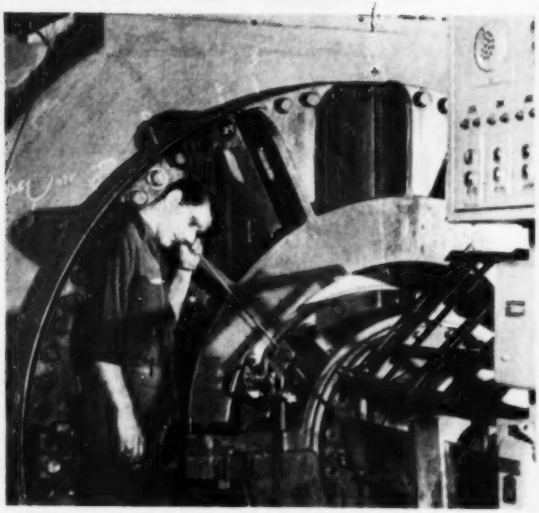
Now wind up the prop and release the model from the bottom of the tub—or better, from the bottom of a swimming pool.—*Ross E. Hutchins.*

Rotor Readied for *Saratoga*

THIS turbine rotor, part of the most powerful propulsion equipment ever used on a warship, will ride the waves in the new aircraft carrier *Saratoga*. "Sculptured" from a solid steel forging, the finished rotor weighs less than the metal machined away. In the picture, a General Electric workman is inspecting dovetailed grooves in the wheels.

Baby Sun Climbs a Metal Sky

ARCHITECTURE students shine a tiny sun on model landscapes with the contraption above, called a Solatron. Designed by a Cornell University professor, it shows how the sun's rays fall in any latitude on any day of the year, at any hour. The students use it to study the orientation of buildings and to design sun-control devices.



Engineer Uses Stethoscope

LIKE a doctor examining your lungs, test engineers use stethoscopes to check up on generators. The one above, a solid steel rod, can detect any rubbing or abnormal sound. One end is set against a bearing in contact with the revolving field, and the other is placed against the bone behind the engineer's ear.

Museum Puts Show on Road

CULTURE is being trucked into the back country in Virginia. Since all the citizens can't get to the state's Museum of Fine Arts at Richmond, a picture-gallery-in-a-truck winds its way from county to county.

Paintings are loaded aboard the specially built semitrailer—as big as the law will allow on the roads—and curator-driver William Gaines takes off. He sets up for business in a town square, church or schoolyard, or on a roped-off street. Electrical cable, canopy poles and stairway are hauled out from underneath the chassis and set up. Flaps on the side and back of the trailer lift up to form the canopy. The Artmobile hits two towns a week and gets an enthusiastic audience of about 400 a day.

Out-of-Focus Photos Made Clear and Sharp by Electronic Device

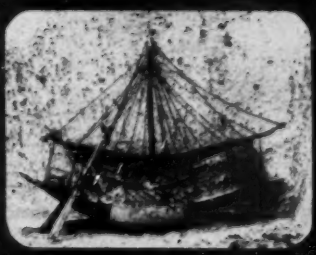
A VACUUM-TUBE-FILLED instrument that makes fuzzy pictures into sharp ones has been invented by H. M. Joseph of the Bureau of Standards and Dr. L. S. G. Kovasznay of Johns Hopkins. The TV-like device scans a blurred original (above left), creates an "enhancing signal" (center), and adds the two to produce a sharp image (right).

Sands of Egypt Yield Pharaoh's Secret Ship

A stone's throw from the Great Pyramid, a young architect finds the 5,000-year-old prize that the grave robbers missed.

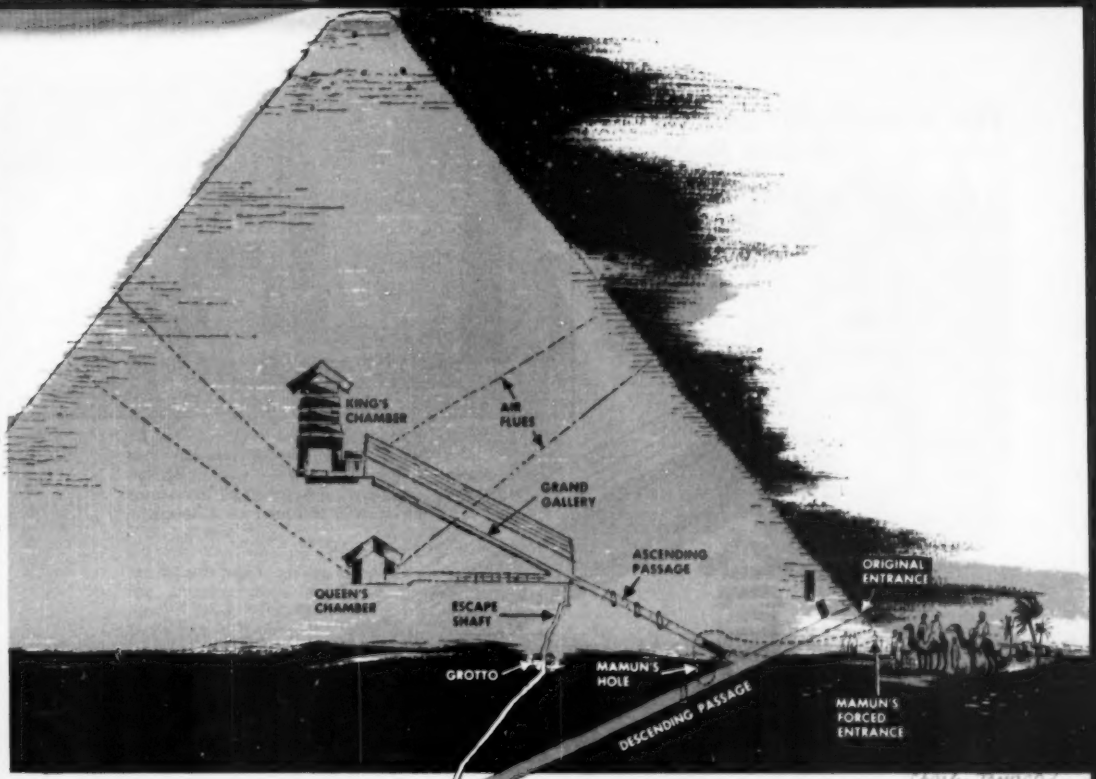
By Alden P. Armagnac

NEW-FOUND SOLAR-BOAT CHAMBER on south side of Great Pyramid, and rooms and passages of pyramid itself, are shown in sectional drawing (which omits lesser pyramids nearby). Sketch from discoverer's description re-creates original appearance of ship in chamber. Only the fringed canopy has crumbled; decks and oars, of dark-brown cedar and sycamore, are intact.



SMALL SOLAR BOAT from King Tutankhamen's 3,300-year-old tomb is toy beside Cheops' vessel, first of such size and magnificence ever found.

CHEOPS RELICS unearthed before include designs on plaque, and his name (bottom) in symbols.



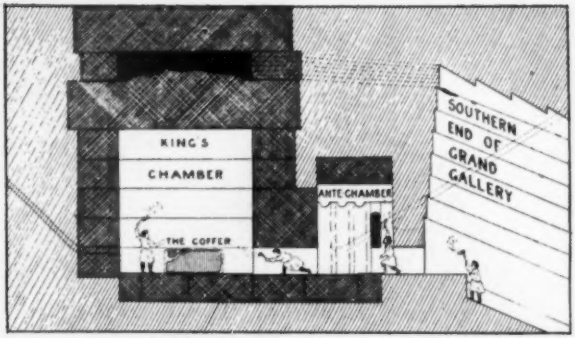
A 55-FOOT royal vessel may reveal the untold story of Egypt's fabulous King Cheops, the mystery man who built the biggest pyramid in the world. By dazzling good fortune, the oared wooden ship has been found intact after some 5,000 years, untouched by time or vandals. Scientists have glimpsed it through a 10-inch peephole cut into a secret underground chamber, a recent and sensational discovery made right alongside the Great Pyramid of Egypt. As this was written, they were preparing to enter the chamber—where they expected to find a sister ship, too—after completing precautionary steps to safeguard the fragile and priceless relics.

Discovering what cargo the royal craft may hold will be a thrilling adventure. Apparently it was built, like the Great Pyramid, for King Cheops himself. Believed to be a "solar boat" to carry the dead Pharaoh through the heavens in company with the sun god Ra, it may be richly stocked with Cheops' supposed needs for the hereafter. Possibly it may yield statues, gold and jewels, paintings, furniture—and inscriptions that would fill in a blank page of history, by telling what sort of man Cheops was and by solving the mystery of how his pyramid was built.

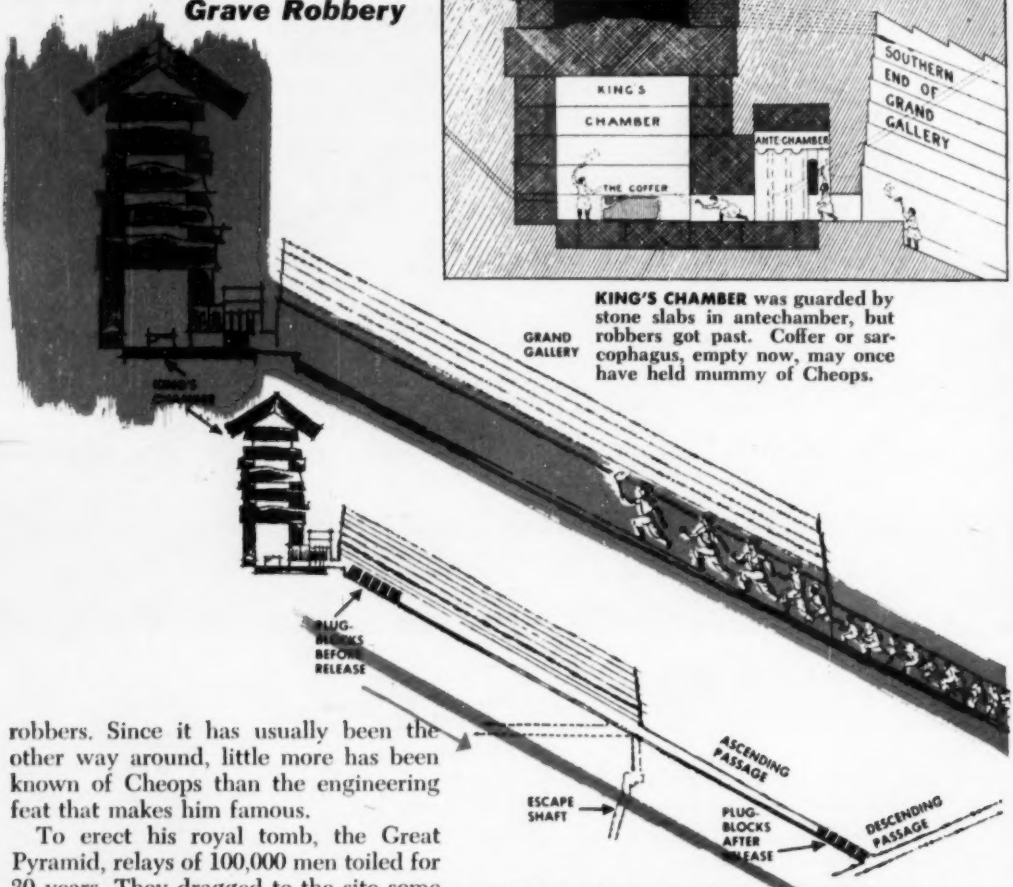
This time archaeologists have won the race with grave

ONLY KNOWN LIKENESS of Cheops is this ivory statuette, found in a temple at Abydos by a famed British expert, Sir Flinders Petrie, and now in Cairo museum.

The World's Biggest Grave Robbery



KING'S CHAMBER was guarded by stone slabs in antechamber, but robbers got past. Coffer or sarcophagus, empty now, may once have held mummy of Cheops.



GRANITE PLUG-BLOCKS poised in Grand Gallery (diagram just above) were freed and slid down incline, to bar entry to Ascending Passage. Notches in ledges, in sketch of Grand Gallery below, probably held posts and crosspieces to restrain blocks until then. Entry to Queen's Chamber (bottom of sketch) must have been filled up to make a smooth chute for blocks.

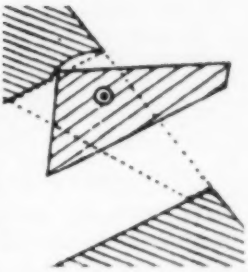
robbers. Since it has usually been the other way around, little more has been known of Cheops than the engineering feat that makes him famous.

To erect his royal tomb, the Great Pyramid, relays of 100,000 men toiled for 30 years. They dragged to the site some 2,300,000 limestone blocks averaging 2½ tons apiece—and somehow, without block and tackle, raised the blocks as high as the 467-foot pinnacle. Some think they used inclined ramps, but no picture or sculpture has ever been discovered to prove it.

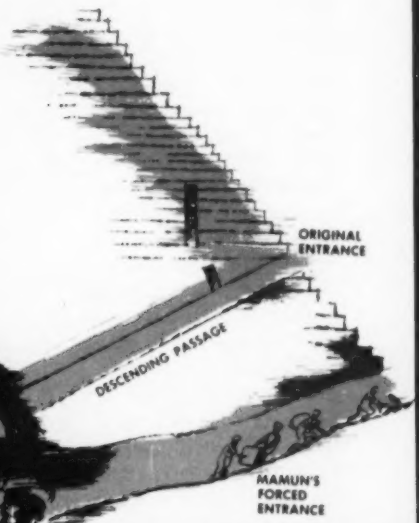
The completed pyramid, almost solid, was pierced only by inclined passages and air flues leading to three chambers within. Perhaps Cheops was interred in the one now called the King's Chamber. Finally, ingenious artifices sealed the pyramid, in what was to prove a futile attempt to keep out thieves forever.

Three "portcullis" slabs of granite dropped in guiding slots and blocked

MAMUN'S HOLE, giving cutaway view of Ascending Passage and bypassed plug-blocks, was hewed from rock by Great Pyramid's robbers. Breaking into passage from side, they raced up it, as below, seeking treasure. Perhaps they found gold, gems, Cheops' mummy—or nothing.



SECRET DOOR of the pyramid swung closed to hide entrance from outside, as final artifice to foil robbers. Unable to find it, they forced a way in by tunneling more than 100 feet through solid rock.



ROBBERS' BREAKTHROUGH, above, followed tip-off by sound of dropping slab. Its fall exposed Ascending Passage's plugged mouth, seen from Descending Passage in picture at right. This sketch and those of King's Chamber, Mamun's Hole and Grand Gallery are from the treatise, *The Great Pyramid*, by Morton Edgar.

off the portal of the King's Chamber.

Granite plug-blocks, freed from restraining chocks, slid down the chute-like Ascending Passage. They slammed home against its lower end and shut off access from the Descending Passage.

Sealing the Secret Passages

The artisans escaped by a secret shaft, closed after them at top and bottom, to the Descending Passage. On their way out of the pyramid, they hid the plugged mouth of the Ascending Passage by covering it with a limestone slab. Lastly, a counterbalanced stone door swung closed behind them, leaving no visible sign of the entrance on the north face of the pyramid.

BOAT CHAMBER'S DISCOVERER, Kamal el-Malakh, stands on its roof. He points to slot cut in slab, resealed with cement, pending experts' entry.

But all these measures were in vain. Such towering strongboxes of stone as Egypt's pyramids must contain enormous hoards of treasure, reasoned those who came after. So robbers broke into every pyramid, however great the effort.

Looting the Great Pyramid was history's biggest-scale grave robbery, a major engineering project in itself. Its enterprising ringleader is said to have been the Caliph Al-Mamun, about the year 830 A.D. Here is the story, pieced together as it must be from old Arabian legends, but largely confirmed by visible evidence today:

Starting on the north face, not far from the secret entrance they had failed to find, Al-Mamun's men drove a tunnel blindly into the pyramid's solid rock. Besides sharpened iron implements, one account says, they used "fire and vinegar." This suggests that they may even have pressed chemistry into service, by employing hot vinegar as an acid to attack the limestone.

The tunnel had progressed about 100 feet southward into the pyramid when the muffled thud of a falling rock slab, somewhere near them, electrified the diggers. Burrowing eastward whence the sound had come, they broke into the Descending Passage. Their hammering, they found, had shaken down the limestone slab hiding the plugged mouth of the Ascending Passage.

To get past the hard granite plug-blocks that barred ascent, Al-Mamun's men bored upward through the softer limestone alongside. Thus they gained entrance to the Ascending Passage.

Fired by visions of gold and precious stones almost within their grasp, they must have raced up the incline. Even the massive portcullis slabs could not stop them for long. Their tools chipped and broke the slabs away, and at last they were in the King's Chamber.

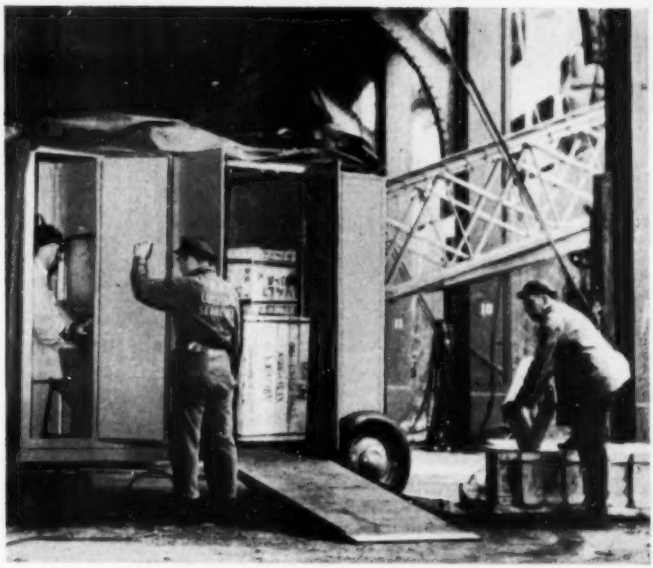
What met their eyes? By one of the old Arabian accounts, which might be describing a mummy, they found "a statue like a man, and within it a man." A jeweled breastplate of gold adorned the body; at the head was a ruby "of the bigness of an egg."

Another story says their booty was "a pot of green emeralds" and a thousand large gold coins. But on reckoning up what had been spent to break into the pyramid, this story teller adds, they found the gold and gems just repaid it!

Tunnel Bears Out Legends

This much, at least, can be accepted—the epic pyramid-cracking feat was fact. The tunnel and breakthrough into the passages, called Mamun's Forced Entrance (or Passage) and Mamun's Hole, may be seen today; the tunnel provides the modern entrance to the pyramid.

[*Continued on page 284*]



Customs Men Check on Boxes With X Rays

CUSTOMS officials can now find out what is inside boxes from overseas without even opening them. They use a big X-ray machine. The operator (far left, inside booth) sees everything in the package on the viewing screen of the Inspectoscope.

Now in use at the Port of New York, the unit is wheeled right out on the docks alongside the incoming vessels.

Glass Takes Sag Out of Clothesline

THIS clothesline won't sag, the manufacturer maintains, and backs his claim with the photo at right—a distinctly unusual "wash" of heavy tools barely tugging at the rope. The secret is a core braided of Fiberglas, which resists stretching. The outer covering is spun cotton. Made by Shuford Mills, Hickory, N. C., the Glas-Core clothesline is also said to last longer than others.

They Say Now .....

DR. LEE A. DUBRIDGE, PRESIDENT, CALIFORNIA INSTITUTE OF TECHNOLOGY: *"The main purpose of science is not to produce bombs and guns and radar—or even radios, refrigerators and color TV—but to advance human understanding."*

DAVID RUBINFIEN, ARMOUR RESEARCH FOUNDATION: *"Quick-acting electronic calculators remove from engineering a sordid routine that hounded many projects into failure in the past."*

S. J. VOUCH, GENERAL ELECTRIC CO.: *"A double-track rapid transit line has a passenger-carrying capacity that is equal to seven eight-lane highways jammed with automobiles."*

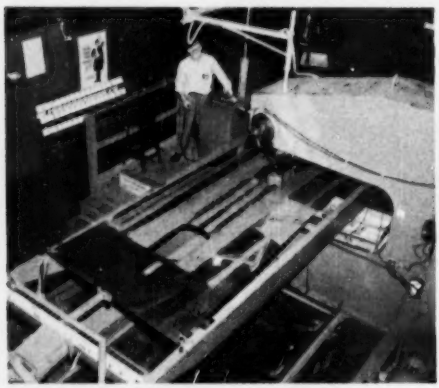
LLOYD V. BERKNER, PRESIDENT, ASSOCIATED UNIVERSITIES: *"A little technological secrecy, like a little poison, may be a good thing, but too much can destroy us."*

Junior Scooter Hauls Junior at Safe 15 M.P.H.

IN DÜSSELDORF, Germany, the budding hot-rod crowd gets a chance to admire the scaled-down scooter at right—but that's all. They watch it whiz along local roads at a 15-mile-an-hour clip on test runs—but it will be made for export only.

The manufacturer plans to promote the scooter as a de luxe replacement for ordinary bicycles.

▶▶▶Because copei trees grow only on soil underlaid by iron ore, geologists in Venezuela saved prospecting time and sank mine shafts where the foliage of the trees showed up on aerial photos.



Movie Film Drives Rivets

STANDARD movie film—bearing holes instead of pictures—tells this giant riveting machine what to do. Mechanical fingers poke at perforations in the film to guide the machine to drill holes, and set rivets in plane assemblies at a Convair plant.

"Sandpaper" Road Stops Skids

THIS slippery-when-wet road is being skidproofed. As one man softens the asphalt with solvent, another spreads an abrasive. Tires will get a better grip on the tiny rough grains of Carborundum, which can reduce stopping distances by a third.

New grass strain under Fred V. Grau's hand survived drought that left big bare spots elsewhere.

'B-27' Bluegrass Seed Improves Finest Lawn

Testing and marketing this new strain took many years, but it blends with other grasses to produce close, springy turf.

By Gardner Soule

"WHAT was the best lawn you ever saw?" I asked Dr. Fred V. Grau of College Park, Md., who probably knows as much about grass as any man alive.

"Mine," he answered instantly.

Dr. Grau's father was an agricultural pioneer who sent him out to collect and identify grasses when he was only knee-high to a grasshopper. He continued to study grass at the University of Nebraska and the University of Maryland. He then became a grass expert for Pennsylvania State University and the U.S. War Department. For eight years he headed the U.S. Golf Association's Green Section, and he now is employed as an adviser by a manufacturer of lawn tools.

His home lawn is a combination of Bermuda, the widely used grass of the South, and Zoysia, a relatively new grass

that retains its color during hot summers and droughts. To this, however, he has added something new.

It is Merion bluegrass, a new strain that produces close, springy turf. Until this fall, only small, experimental lots of this seed were put on the market. There's only a little of it in Dr. Grau's lawn now, but he intends to add more because he believes it will blend with his other grasses and give him an even finer lawn.

Merion was discovered in 1931 by Joe Valentine, the superintendent at the Merion Golf Club in Ardmore, Pa. He noticed that some grass on his 17th tee was darker than other grass. He watched this patch for five years. A rash of crabgrass around it failed to invade it, and it stayed greener than other grass during droughts. Valentine mowed the course closely—down to half an inch—and the new grass still thrived.

So he sent some of it to the Green Section of the golf association, which works with the Department of Agriculture at Arlington Farms, near Washington, D.C. There it was dubbed B-27. The "B" stood for bluegrass and the number indicated that it was one of 150 new strains of bluegrass that had been recommended for testing.

The B-27 performed as well for the Department of Agriculture as it had for the Merion Golf Club. So it was tried out at 45 other places—golf courses, football stadiums, agricultural experiment stations, and so on. These tests showed it resisted leaf spot, a common disease of bluegrass.

Dr. Grau, who was so impressed by the B-27's showing that he put it in his own lawn, considers the fact that it was developed, by nature, on a golf course significant.

This indicates, he believes, that it will survive under the heavy traffic of children, pets and lawn parties.

UNRIPE GRASS IS CUT and then left to cure in fields in one harvesting method that is used by seed producers. Straw is then taken to the threshers and the seed is knocked out of it.

When the decision to produce the Merion grass seed commercially was made, seed was sent to growers in Oregon, Washington, California, Idaho, Pennsylvania, New York and Kentucky. It grew especially well in the Pacific Northwest, and most of the seed that will be on the market this month was harvested there in June of this year from crops planted in 1952.

The growers, however, had troubles. When planted as a crop in rows 28 inches apart, the B-27 refused to stay put. It spread every which way, and thickly covered the fields. This fault in the

EVEN WHEN PAMPERED, it takes the Merion bluegrass three years to reach tough maturity.

The Oregon farm shown above uses a sprinkler system on its lush stand of the new bluegrass.

grower's field, however, makes the grass more desirable for a lawn. For a good turf, Dr. Grau points out, you need a grass that spreads rapidly in all directions.

There are 2,500,000 Merion seeds to a pound, as compared to 750,000 seeds of creeping red fescue, a common grass with tiny seeds. To plant it, says Dr. Grau, you do not have to dig up your old grass and start over; the Merion will push out a good deal of the old grass within three years. You should, however, first aerify your lawn.

This consists of punching lots of little holes in it with one of the tools designed for the purpose. Then you should fertilize the ground and broadcast the seed. Much of it will land in, and be held by, the holes. Ordinary lawn mowing and lawn traffic will cover other seeds sufficiently.

THIS GIANT COMBINE harvests seed for some growers. It cuts the grass, threshes it, puts the seed in bags. Merion seed harvested in June will be put on the market this month.

The First Cost Is High

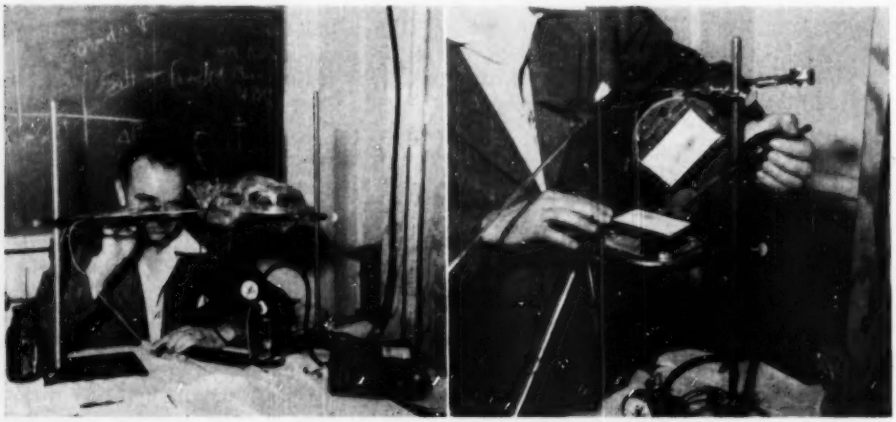
The price of the new seed may shock you. It will probably be about $5 a pound. Two pounds, however, should suffice for 1,000 square feet, and Merion seldom has to be re-seeded. The results may disappoint you at first, because Merion grass does not grow fast, and the full benefits will not be seen in your lawn for three years.

Dr. Grau cares for his lawn the way a golf-superintendent cares for his turf. This involves aerifying, to let water, oxygen and food down to the roots; watering whenever the grass starts to wilt (soaking, not merely sprinkling); feeding more often than is customary (Merion grass, he says, is almost always hungry); and mowing whenever it is needed.

Neither Dr. Grau, who helped with the tests of Merion seed, nor Joe Valentine, who discovered the strain, will profit from the new seed because a product of nature is not patentable. Nor will the agronomists who spent several years testing the B-27 bluegrass. The seed is available to all reputable growers who wish to produce it. END

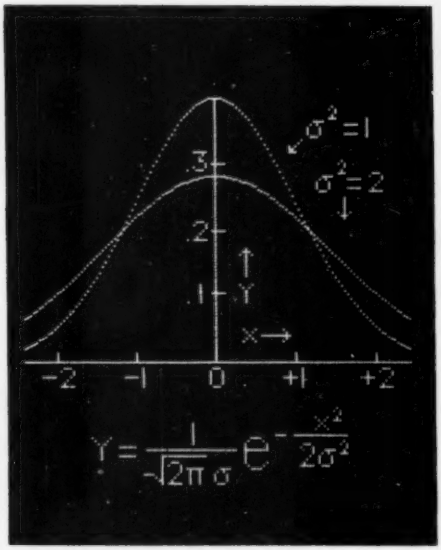
Tractor-Mounted Ditch Cleaner to Sweep Irrigation Canals

DIRT really flies when this retractable circular cutter digs in to reshape ditches. The tractor-mounted tool can clean out trenches up to 4½ feet wide and three feet deep, easily slicing through four-inch roots. The tool, which is manufactured in Britain, is expected to speed up the job of keeping irrigation canals open.



Machine That Works Like Kidney Changes Salt Water into Fresh

ONE way to get fresh water from the sea is with a mechanical kidney. A small model (above) has already extracted salt from brine, using the same principle that body organs employ in purifying fluids. It has two porous clay plates (above right) enclosing a thin oil film. The oil "membrane" lets water molecules through but stops salt molecules. The inventor, Gerald Hassler of the University of California at Los Angeles, thinks a big machine could desalt thousands of gallons of sea water a day.

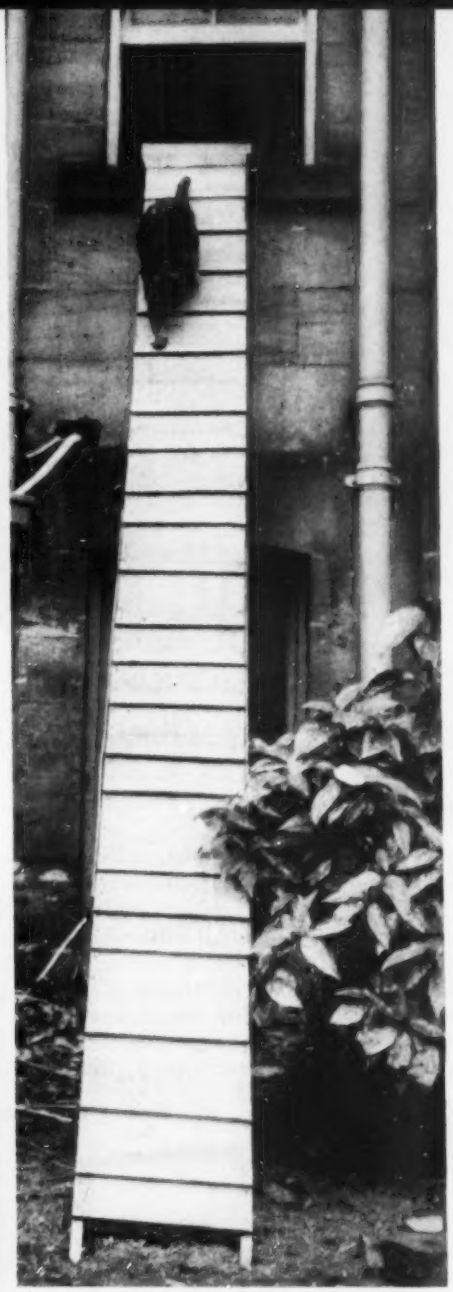


Computer Writes Out Answers

An electronic brain at the University of Illinois draws pictures of the intricate problems it solves. Graphs like the one above take hours of handwork but the Illiac plots them in seconds for recording on film. It can also tap out answers on an electric typewriter or flash them on a TV screen.

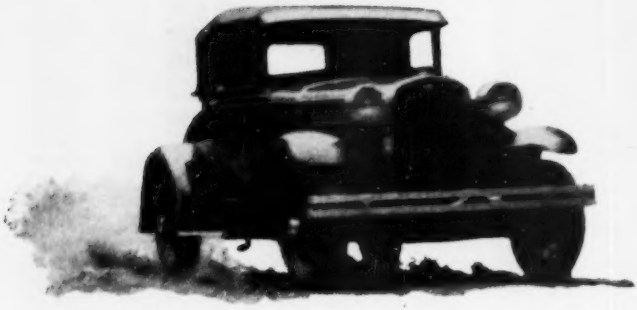
Teacher Gets a Mechanical Hand

When youngsters do their arithmetic on a machine invented at Harvard, it checks the answers, leaving teacher free for teaching. Problems are solved by moving levered numbers. Unless the right answer is fed in, the tape won't move on to the next problem.



Cat on Prowl Walks the Plank

This stairway saves Timmy's owners a hike downstairs to open the door every time he wants in or out. Crossbars nailed across the plywood catwalk keep the animal from sliding headfirst to a landing and offer grips when he heads for the open window.



A Lament for the Model A

The car that ran like a puppy seems wonderful —in retrospect—to this automobile reporter. Why, he asks, don't they make it any more?

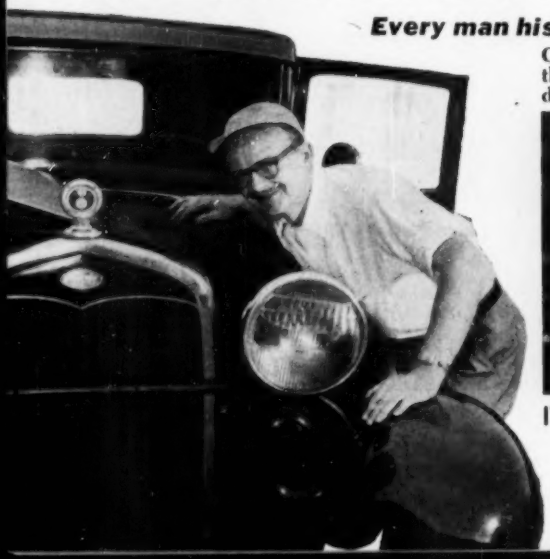
A car built

By Frank Rowsome Jr.

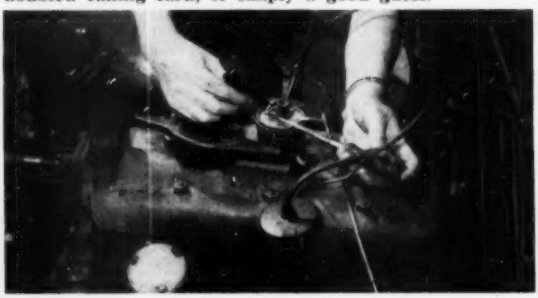
SOMETIMES when Detroit unwraps its latest wonder—the newest blend of gleam and gadget devised to make you discontented with what's in the garage—I think dreamily back to a sweetheart of a car that they don't make any more. Like many long-ago sweethearts, she was gawky, even a little goofy, with plain-Jane virtues. But the Model A Ford was also, in case you've forgotten, one of the most wonderfully satisfying cars ever built.

The Model A was an uncommonly *willing* car, like a friendly farm dog. (Ever noticed how some cars don't really want to go? They sit silently in the garage, morosely pondering what trouble to have next. Or else they behave like

Every man his own mechanic



Gapping the points was a breeze. If you had no thickness gauge handy, you used a thin dime, a doubled calling card, or simply a good guess.



for the ages . . **Kid sister, 1954, has more than three times the power, weighs half a ton more.**

child actresses, coughing theatrically in the carburetor throat or stalling petulantly in the driveway.) The Model A, in contrast, had the personality of a puppy: it wiggled all over, it wanted to go, it ignored mistreatment, and it ran until you shot it through the heart.

Shrewd engineering could be detected everywhere. Provided you handled the clever choke-and-mixture rod right, which was about as difficult as striking a kitchen match, the engine *invariably* started. One Maine winter, with temperatures around 20° below, I caught it on the first turn every morning for weeks.

Its designers had a realistic view of human nature, for they made it a difficult car to mistreat. Even the dimmest

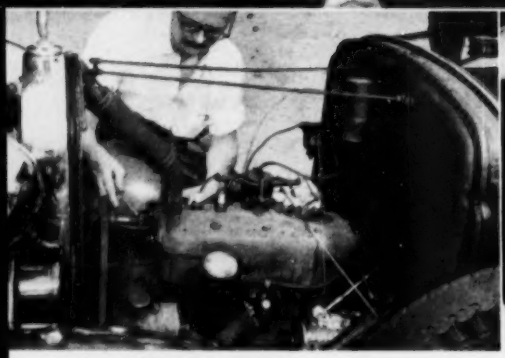
A satisfying sense of participation

That thin dime, rarely needed then for tolls, was convenient, too, for setting the idling speed. A thumbscrew adjusted idling mixture.

A family car with built-in privacy

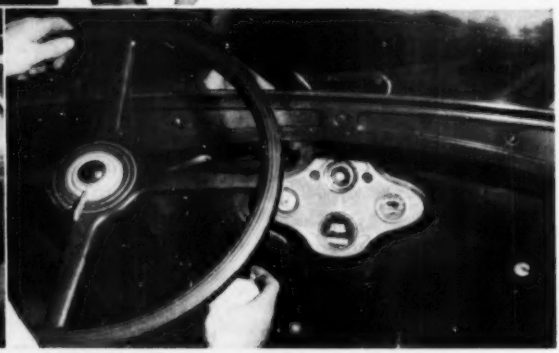
Kids and dogs loved to ride the rumble, where the whistling wind and the song from the tailpipe made music. If it rained, you scrounched down low, staying fairly dry as long as the driver kept going. But the rumble seat could be cruel on a bitter winter day.

Mint-condition Model A in these photos is the proud possession of PSM's art editor, Howard Jensen.



Plenty of elbow room

You never had it so good in engine accessibility. Almost nothing was awkward to work on, and the fender valley made a fine tool tray.



Nothing to do but drive

She'd climb briskly to 55, but from there on up acceleration was leisurely. Still, you could run wide open for hours on end.

lady driver couldn't proceed with the choke out: the moment she took her fingers off the knob, the choke promptly went back where it belonged. If, impelled by the curious female instinct for wrongheadedness, she persisted in driving with the spark retarded, or with the mixture full rich, or with the parking brake on, nothing grievous happened. It didn't run very well then, but it ran.

That tough old engine would march contentedly for 60,000 miles with only casual attention. If you tossed it an infrequent overhaul, it would cheerfully go forever. If cruel and unusual punishment busted something, you just wrote off to a mail-order house, screwed on the new part yourself and drove on for another hundred thousand miles.

It ran well, too. By a happy combination of weight, balance and wheel size, it could trundle through an amount of snow or mud that would immediately bog down those terraced gardens of sheet metal that we drive nowadays. Top speed —65 m.p.h. at 2,785 r.p.m., more downhill—could take you from one city to the next almost as fast as the current road locomotives. It *liked* to be driven hard. There was none of the incessant plug-

burning, point-pitting and diaphragm-rupturing that reflect the bilious bad temper inside newer engines.

Lift the hood on a Model A next chance you get and admire the calculated simplicity underneath. That engine was about as intricate as an egg beater. You could very nearly overhaul it with a screwdriver, pair of slip-joint pliers, monkey wrench and a little run-of-the-mine profanity. Modern engines, in contrast, demand hundreds of dollars in tools, a cozy intimacy with dwell angles, milliamperes and inches of mercury, plus a repertory of sulfurous swearing.

No troublemakers. There was a wonderful starkness about the Model A's engine compartment. Consider for a moment the troublemakers it *didn't* have. There was no fuel pump, no vacuum pump, no accelerator pump, no automatic choke. There was no voltage or current regulator, no centrifugal spark advance, no vacuum spark retard. There was no crossover heat valve, no thermostats, no hydraulic lifters. Above all, there were no relays. (Does anyone know why present-day engineers plaster relays over an engine like barnacles on a rock? Surely even engineers know that relays are the most bothersome thing invented since marriage.)

It was an engine you could work on easily. If you wanted to tighten the water-pump packing nut, you needed a screwdriver and five seconds. If you wanted to drain dirt or water from the

[*Continued on page 286*]

What Do You Think?

This sentimental eulogy of an obsolete auto will, PSM suspects, strike a happy chord with some readers, a jangling dissonance with others. For the five most interesting letters of comment, of 150 words or less, received by Oct. 1, 1954, PSM will pay $25 each. Address: The Editor, POPULAR SCIENCE MONTHLY, *353 Fourth Ave., New York 10, N.Y.*

Space for three, in a pinch

The stick shift could be a problem with three in front; there was a tendency to shift the center passenger's kneecap into second gear.

Service almost in your lap

Center-fill fueling was around then, too. You saw what you paid for: at about ¾ full, the gas sloshed up into view on the gauge glass.

All aboveboard but the battery

To water the cells, you folded back the mat and pried up the access plate. Conking your head on steering column was part of the job.

Clocks for Arctic Get Antifreeze Oil

OF THE six clocks pictured at the left, three are solidly frozen. Three are running perfectly. All are under seven layers of glass in a cold box that can go down to 150 degrees below zero.

The stopped clocks, with regular oil on their bearings, gave up at 65 below. But the others, in the foreground, running on a new cold-weather lubricant, haven't missed a beat. The new oil is a synthetic product, developed by the Elgin National Watch Co.

The clocks used in the tests are from Air Force airplane instrument panels. The lubricant was made for high-altitude Arctic flying.

Plastic Pipe Laid at Tractor Speed

PLASTIC pipe, to carry cold water, now can be laid at the rate of 100 feet a minute. A machine made by Franklin Plastics, Franklin, Pa., digs a trench, unreels the pipe and covers it with soil, all in one continuous operation.

Living Room Revolves in This House of 1964

LIVING-ROOM furniture arranged on a big turntable is suggested for the house of the future. You would push a button to turn everything to face the wall-size TV screen, the fireplace or the view into the garden. This is one of the features in GE's all-electric House of 1964, a model of which is shown at left. The self-supporting plastic roof is also the interior ceiling.

New Ideas
FROM THE INVENTORS

1 "Trailer" to Ride on Car. With this sleeper loft fitted over the top and tail of your car you could enjoy many of the tour-and-travel advantages of a trailer at little sacrifice in speed, maneuverability or the freedom to park in limited space. The stiff, lightweight structure, attached rigidly to the car body, would need no separate wheels or brakes and couldn't cause swaying or jackknifing.

2 Machine to Have Two Keyboards. A typewriter that had two or more keyboards might simplify the preparation of scientific reports or multilanguage documents. Its carriage could be shuttled between sections when the writer needed to switch from standard characters to mathematical symbols, or a foreign alphabet.

3 Leash to Heel Strong Dog. Aided by this harness, a little child could keep a big dog under control. On a quiet stroll, the dog's stride would be unrestricted. But if he started to take off after a cat, an expansion spring in the collar would transfer his own pull to the leg harness and keep him from getting in running position.

Please turn the page for more new ideas.

MORE New Ideas from the Inventors

4 Tray to Keep Toast Warm. Heat rising from an electric toaster into this clip-on food warmer could serve either to toast biscuits and muffins or to keep pre-toasted bread slices from cooling off. Placed on top of a conventional toaster, the perforated pan bottom and its hinged cover would become an all-purpose miniature oven.

5 Lipped Glass to Down Your Pills. If you're one of those people who can't swallow a capsule without chewing it first, this pill-pocket might be just what the doctor ordered. Formed as part of a clip, it would fit inside the lip of a glass. It would help you take medicine by floating a pill down your throat with a sip of liquid.

6 Gun to Light Its Target. Police and watchmen might be better able to cope with attacks from the dark if they could aim a light and weapon with the same hand. This flashlight would be strapped to an attaching plate which could be snapped instantly over the barrel of a revolver. Angle and focus of the flashlight would be adjustable so its beam and the sight of the gun could coincide. An officer would have greater freedom if he had one hand free, and he could aim straight even while running.

U. S. patents on these inventions have been granted to: 1. H. Cook, University Heights, Ohio; 2. C. Brumhill, Leicester, and A. Pateman, Rothley, England; 3. E. Patience, Hempstead, and W. Patience, Franklin Square, N. Y.; 4. D. Soccoli, New Britain, Conn.; 5. F. Bryan, Buffalo, N. Y.; 6. W. Davis and G. Millstead, San Francisco; 7. R. Lightbourne, Birmingham, England; 8. B. Weaver, Yuba City, Calif.; 9. H. Cohen, Brookline, Mass.

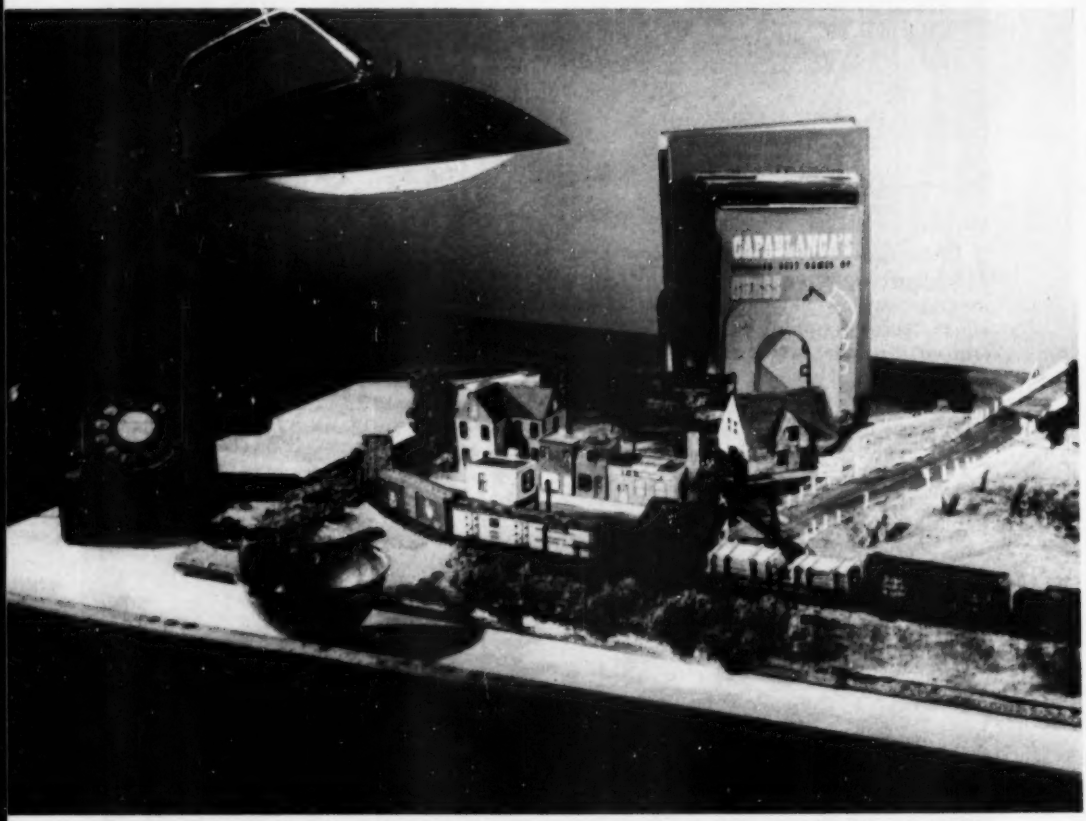
7 Chair to Form Ironing Board. A folding step stool that converted to an ironing board would squeeze more useful kitchen furniture into less space. A pivoted arm on this stool would act as a two-way catch, locking the board vertically to serve as a chair back, or in a raised, horizontal position for use as an ironing board.

8 Table to Serve as Darkroom. With this three-way processing table you could develop film in a lighted room. Light-tight sleeves in the cover would provide access to the developing tanks. Each of the tanks would be built into its own drawer; in a darkened room you could use them in the usual way either by pulling out the drawers or by lifting off the removable table top.

9 Reflectors to Ripen Fruit. Fruit, berries, and other plants might ripen sooner and to more uniform size if they were exposed to extra sunshine. This inventor would scatter flakes of mica, metal foil or similar reflecting material beneath a tree so sunlight would be bounced upward to the fruit. The reflectors might also slow evaporation of moisture needed by the roots.

On coffee tables and in suitcases, tiny TT gauge is tootling along high, wide and handsome on . . .

The Boom in



Around and around thunders this TT-gauge train over its two-by-three-foot empire. Houses, 1/120

ENGINEER, yardmaster and gandy dancer, Hal Joyce, originator of TT, surveys his domain.

MIGHTY MITE: TT loco is small but bursting with power—an HO-gauge motor is squeezed inside.

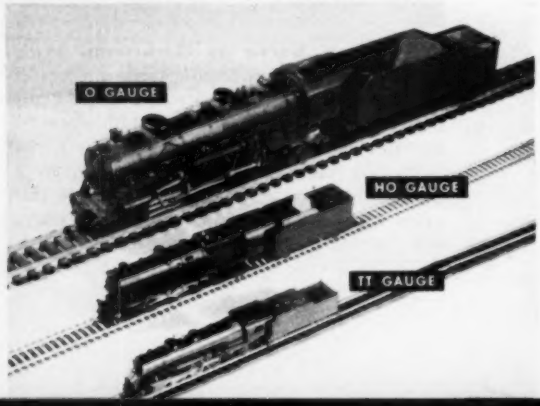


Table-Top Railroads

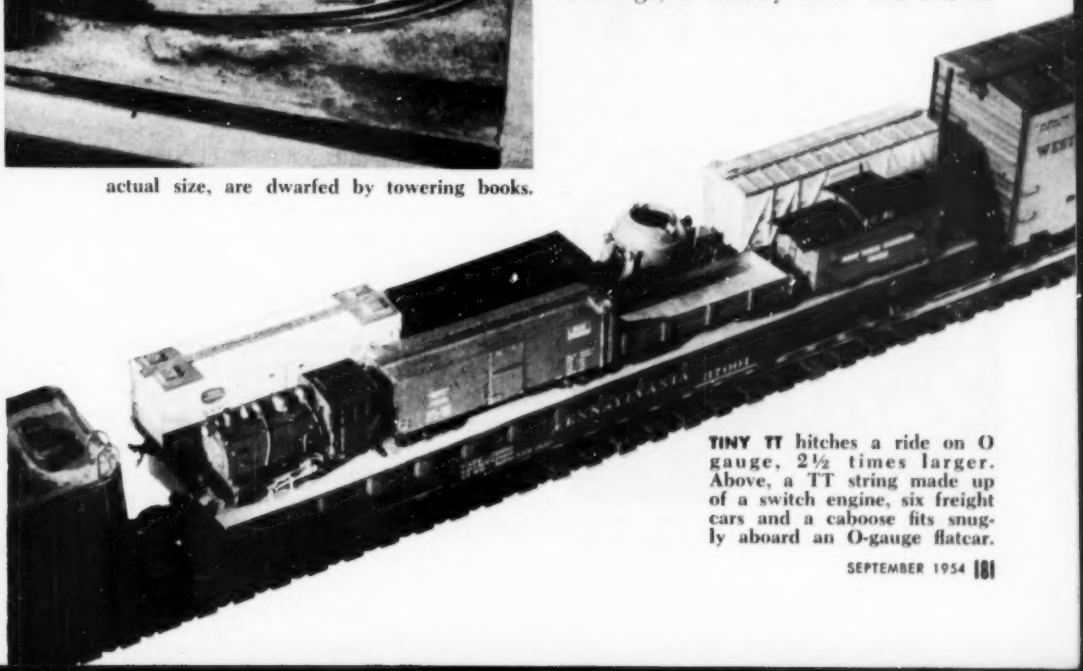
By Herbert O. Johansen

actual size, are dwarfed by towering books.

IF LACK of space around the house has kept you out of scale-model railroading, TT gauge may put you in business. The top of even a coffee table (TT stands for table top) has room enough for this smallest of the popular model railroads to sprawl about among the scenery.

On the other hand, if you can make a real land grab, as Roy Joseph of Petaluma, Calif., did for his six-by-40-foot TT layout, you can have the scale equivalent of about 60 miles of track, with a couple of dozen locomotives speeding a hundred or more freight and passenger cars over mountains, deserts and valleys.

Or if you're the roving kind who wants to take his model railroad with him wherever he goes, you can do that, too. Twenty-six-year-old Ray Boss of New London, Conn., built his TT layout in a small carrying case. It has hills, tunnels, a bridge, a country store—and lots of



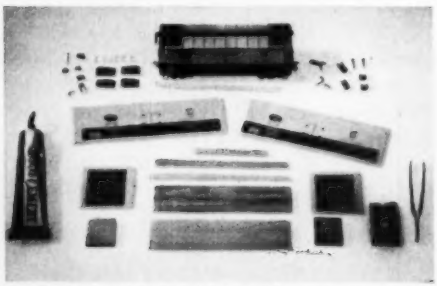
TINY TT hitches a ride on O gauge, 2½ times larger. Above, a TT string made up of a switch engine, six freight cars and a caboose fits snugly aboard an O-gauge flatcar.

PORTABLE PIKE belongs to Ray Boss. A water wheel turns and a man rocks as train runs.

CLOSE-UP SHOWS DETAILS of the Boss pike. Everything is TT scale—1/10 inch to the foot.

gadgetry. When Ray starts his train, a mill wheel turns, an old man sitting in a rocking chair on the porch starts to rock, a dog at his feet wags his tail. All this in 12 by 24 inches.

TT fans, like their brother enthusiasts in the larger HO and O gauge, take their railroading seriously. When operating their pikes, they often wear the engineer's peaked cap and denim jacket. For TT, however, they do not recommend wearing engineer's gloves: might lose a tiny locomotive or a couple of cars down the gauntlets.



TO ASSEMBLE this freight-car kit, you need only a razor blade, tweezers and a tube of glue.

ADVANCED TT ENTHUSIASTS build from scratch. Here Glyn Lewis works on a coaling station.

Although HO is the most popular gauge in scale-model railroading today, TT is fast becoming known as the modeler's model railroad. In the larger gauges, all kinds of equipment, locomotives and cars can be bought ready to roll. As for the kits, some of these, say such TT enthusiasts as Glyn Lewis of New York and Sherman Dance of Haworth, N.J., have been oversimplified, don't offer enough challenge.

Kit, "Scratch," or "Free-Lance"

TT is practically all kit, and although you don't have to be a master machinist to put them together, they do offer a challenge to the modeler-railroader. Then, of course, as in all gauges, there is the opportunity for "scratch," actually building your own equipment, or "free-lancing," modifying kit equipment to meet the specifications of your own private pike.

Since TT is a comparative newcomer and does not have the variety of kits that, for instance, HO does, the urge to scratch and free-lance is greater.

When William Healion of Homewood, Ill., a National Broadcasting Co. TV director, switched from HO to TT, he wanted to include trolley cars in his lay-

out. TT didn't offer any trolley-car kits, so he built his own from scratch.

Working from a floor plan and a photograph, he first built a Chicago-type Green Hornet, faithfully following details of doors, windows, trim and markings. Now, at the urging of his wife, a trolley-car enthusiast, Healion is recreating TT miniatures of the old scarlet Pullman trolleys that were once a familiar sight on Chicago's 1,300-mile trolley system.

Healion's layout is a little top-heavy in locomotives, with 28 locos, 12 passenger cars and about 40 freight cars. He runs them on an elaborately landscaped 6½-by-12-foot table layout in his basement. He likes TT "because it offers a lot more railroading in a small space."

Matchbox Railroading

Lately he has been eying a new, even smaller, Swedish scale. This is HH. An electric locomotive in this scale fits snugly in a penny matchbox. England has an OOO gauge, also smaller than TT. The motors for these tiny gauges, however, have to be built to order, making them expensive and hard to get.

The *scale* in scale-model railroading refers to its size as compared to the full-size, real equipment. In TT gauge, the scale is 1/10 inch to the foot, which means that it is 1/120 actual size. If 120 TT locomotives were laid end to end, the string would equal the length of an actual locomotive. Next is HO, which is about 1/7 inch to the foot, while O gauge is ¼ inch to the foot. In between there is an S gauge, measuring 3/16 inch to the foot. All equipment, including track and scenery, is accurately scaled to the same proportions.

Tight Fit: HO Motor in a TT Loco

The originator of TT gauge, Hal Joyce of the H.P. Products Co., Hartford City, Ind., is a scale-model railroader from way back. He started with old standard gauge at a time when the now-big-size O gauge was something you wound up—too small for an electric motor. When motors for O-gauge locomotives came along, he switched to that. Then HO gauge of European make came on the market, and Joyce went into that smaller gauge. For his next step down the scale he had to devise his own—and the 1/10-inch-to-the-foot TT gauge was born. He used HO motors, slightly modi-

"GIANT" STORE SIGN above is actually one inch high. TT fans cherish such microcosmic details.

REALISM IS ADDED by touches like this factory. Note lumber cars behind the switch engine.

Know Your Railroad Slang

Dyed-in-the-wool scale-model railroaders not only copy real railroad equipment but also talk like railroad men. Here are a few samples of this colorful jargon:

Big shot: yardmaster
Black snake: a train of coal cars
Cabbage cutter: a freight engine with low wheels and a long stroke
Calliope: an old steam engine
Crummy: a caboose
Glory train: a train made up of empties
High iron: mainline track
Jack rabbit: a train that starts in jerks
Merry-go-round: a locomotive turntable
Peanut roaster: a switch engine
Pigpen: a roundhouse
Rawhider: a bad-tempered model-railroader
Red ball: a fast freight
Tinsel string: a circus train

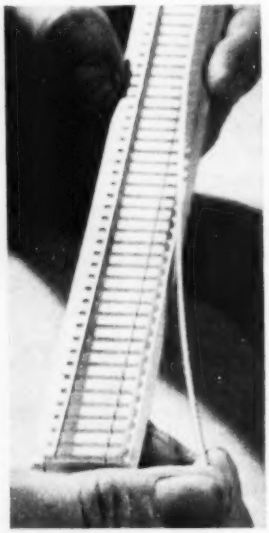
fied to squeeze them into the smaller locomotives.

World War II came along and all of Joyce's time and plant facilities went into war work. It wasn't until the middle Forties that he got around to building a few of the tiny locomotives. His friends saw them and wanted some; his wife and his friends' wives saw them and thought them cute and small enough not to get in the way around the house; Joyce thought he saw a good business venture. TT railroading was started on its way.

Using the same motors as the larger HO gauge makes TT locomotives very powerful—capable of pulling more than 100 freight cars up a grade. The power of the little locos often surprises people who see them in action for the first time. At a recent model-railroaders' show a TT Pacific locomotive was hauling a long string of freight cars at a realistic crawl.

"Say," warned a spectator, "you're going to strip a gear or burn out the motor; that loco can hardly pull her load."

The TT operator twisted the rheostat and, to the amazement of the spectator, the train became almost a blur as it hit a scale speed of 120 miles an hour.



TRACK FOR TT is easily assembled. Brass-strip rails are simply set into pregrooved wooden roadbed.

Today TT is in the growing-pains stage. It can be compared to the position of HO in the middle 1930s when O gauge ruled and anyone in the smaller gauge was considered crazy. TT is often hard to buy in hobby shops. But there are a dozen or more exclusive TT manufacturers throughout the country making a variety of locomotives, track, roadbed, switches, rolling stock, buildings and other scenery—in fact, all you need to operate a model railroad.

And, if you are at all handy with tools, the scale is not too small to scratch your own stuff with fine detail. One example is a control tower built by Glyn Lewis. About 2½ inches high, its interior detail includes a potbellied stove, a coffee pot, an ash tray with a cigarette in it, a clock on the wall, and the operator working in his shirt sleeves.

Fans Like TT for Different Reasons

Why are so many O and HO fans going TT?

Some like it just because it is small. They like to work with small things.

Others, not limited by space, just want as much railroad as they can get. A case in point is chicken-rancher Ray Joseph, with his six-by-40-foot layout taking up practically all of one chicken house. TT enables him to have 300 feet of track, 12 steam-type locomotives, 10 diesels, 80 freight cars, 18 passenger cars. His pike includes a pavilion with a revolving disk on which couples "dance" to the music of Harry James; a rheostat spotlight enables him to get dawn-to-dark lighting effects; his scenic panorama includes a desert section, a farm area, mountainous terrain. Built on five panels, the layout is portable by truck. Joseph intends to show it at veterans' hospitals and other institutions for shut-ins.

Then there are the true table-toppers—those who have gone into TT because they lack the space to build realistic layouts in a larger gauge. A New York businessman, who lives in the city in the winter and in the country in the summer, built his layout to fit the top of a baby grand piano. It travels with him. TT enabled a Navy commander to have a pike in his submarine. He built it on the lid of his foot locker.

And how many coffee tables TT has turned into roadbeds for scale-model railroads, no one knows. END

This Furnace Dries Your Wash

HAVING a hard time getting the wash to dry on the clothesline? Then just put it in the furnace! That's what you can do with a combination warm-air gas furnace and clothes dryer (right) called Heat-N-Dry, made by the Herbster Products Co., 877 Addison Rd., Cleveland. Moisture-laden air is driven off outside the house.

Heater-Cooler Fits in Wall

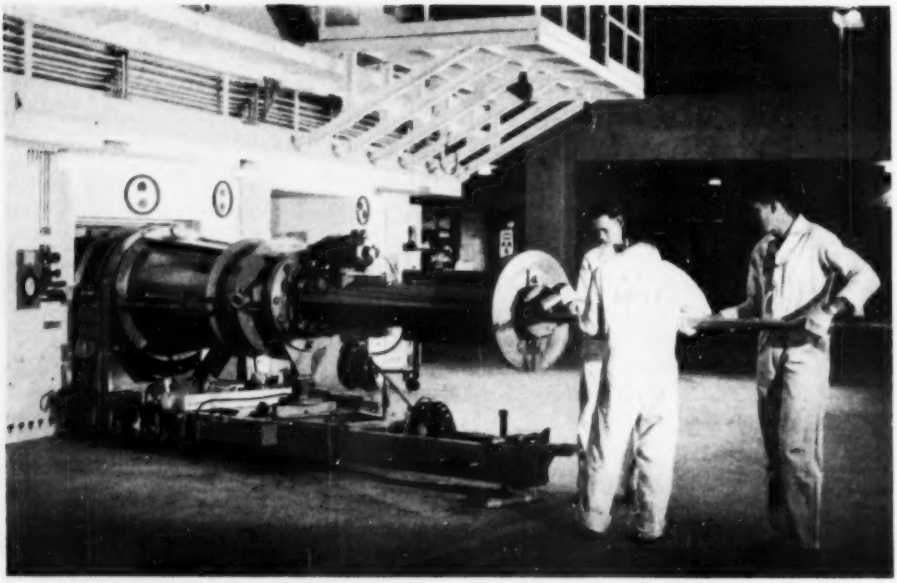
A NEW year-round air conditioner (above), working through a forced-water system, is so compact that room units with individual controls can be recessed between attic joists or wall studding. It heats in the winter, cools in the summer. Hydraline Products Division of Borg-Warner, Kalamazoo, Mich., makes it.

Gauge Tattles on Dirty Filter

WHEN to clean the filters in a forced hot-air furnace is always a question—how dirty is the air? Now a gauge is being manufactured to tell exactly how dirty a filter is. Made by Rex Metalcraft, Indianapolis, it measures air-flow pressures. The resistance to air flow indicates the amount of dirt. Keeping unit clean saves about a dollar per month.

Heat Controlled in Each Room

EVERY room in a home can have a different temperature, if the owner chooses, with this new heating system. Pipes conduct steam from a central furnace to room heat exchangers. Individual, nonelectric thermostats regulate steam flow. Called SelecTemp, the system is made by Iron Fireman, 3170 W. 106th St., Cleveland.

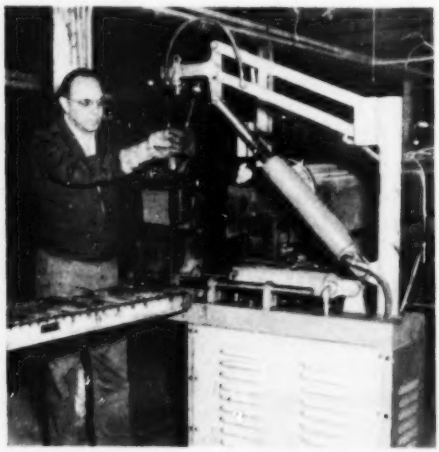


Cannonlike "Coffin" Unloads Hot Stuff from A-Furnace

THE men above are not ramming a charge down the throat of a big gun—they are nudging a "coffin" against an opening in the Atomic Energy Commission's Materials Testing Reactor, near Idaho Falls, Idaho. The long-barreled cask moves in to extract plugs of material made radioactive, then trundles them away for tests.

Six-Footers Get a Bed-Stretcher

THESE bed extenders will let a basketball center stretch out at night. They are blocks of hardwood with standard bed-rail hardware, quickly installed without tools. Ralph Howard Co., 3714 Creston Dr., Indianapolis, makes them in two sizes.

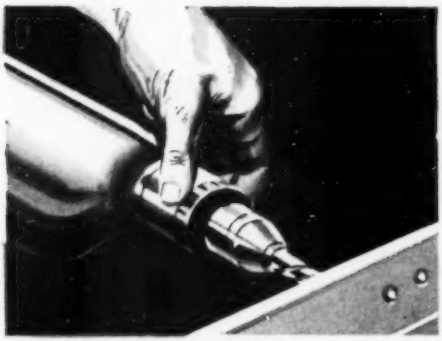


Battery Wrecker Salvages Lead

THE contraption above pulls 20 to 50 pounds of scrap lead out of a junked car battery. Infrared rays soften the cases and a hydraulic ram yanks out the lead plates. Sonken-Galamba, Inc., Kansas City, Kan., sells the Vinerson extractor.

I'd Like to see them make...

FOUNTAINS WITH RUBBER SPOUTS for installation in schools. Juvenile horseplay breaks many a child's tooth on the metal spouts now in use. —*Kermit L. Seehawer, Appleton, Wis.*



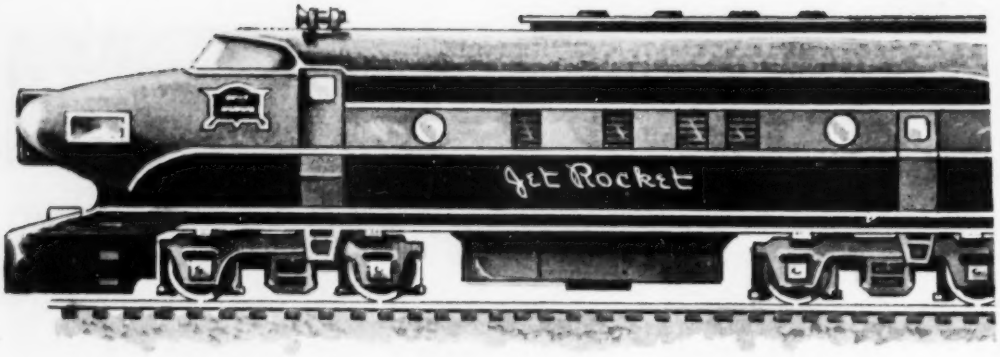
ELECTRIC DRILLS WITH RHEOSTATS built into the casings to control speed. Kitchen mixers have speed stops for various jobs, why not drills? —*M. R. Venezia, Squantum, Mass.*

INFORMATIVE HIGHWAY SIGNS, to be placed near city limits, listing the local radio station's call letters and frequency for easier tuning of car radios.—*I. J. Gershon, Dayton, Ohio.*

POTS WITH WEIGHTED BOTTOMS to keep the nested utensils from tipping over so easily, particularly when they are empty.—*Mrs. S. A. Bartholomew, Binghamton, N.Y.*

A CARBON-DIOXIDE CAPSULE—like those used to blow up rubber boats—for inflating the high-pressure bicycle tires that are now in use.—*Raymond Nunn, Union, N. J.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by *Popular Science Monthly* readers. What is *yours?* We will pay $5 for each one published. Please use government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.



Midwest Gets Snaky Train

Short, ground-scraping coaches built to round curves at high speeds are the newest innovation in American railroading.

NEW TRAIN, called the Talgo, originated as a Spanish design, was built in U. S. by ACF Industries. Spanish version, shown above, has streaked through mountainous terrain between Madrid and Hendaye, on the French border, for four years, beating standard trains by hours.

THE world's limberest passenger train —it goes around corners like a snake—will be shuttling the 160 miles between Chicago and Peoria, Ill., in the near future. It's like nothing else ever ridden by American rail travelers.

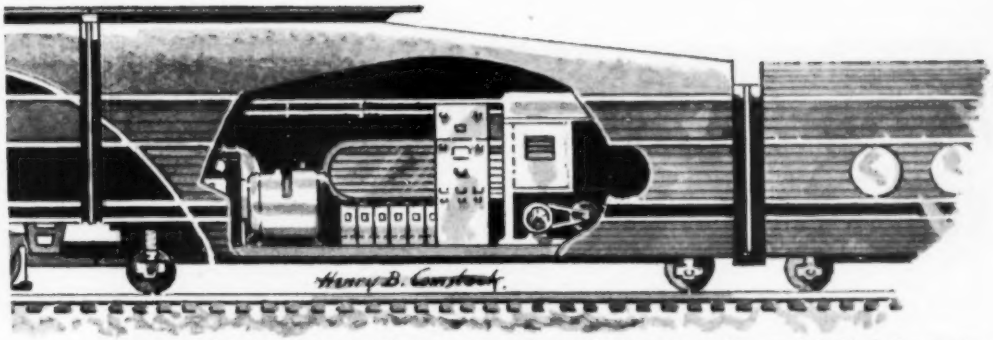
It's low. The floors are 25 inches above the rails, compared with more than 50 inches for the standard railway coach.

Like the Toonerville Trolley, the cars are short. They measure about 36 feet, compared with around 80 feet for the standard U.S. railway coach.

Stranger still, most of the cars have wheels on only one end. And they aren't the familiar four-wheel trucks in use practically the world over—they're just two wheels, one for each rail, on separate stub axles. The car-ends without wheels ride piggyback on the lips of the cars next to them.

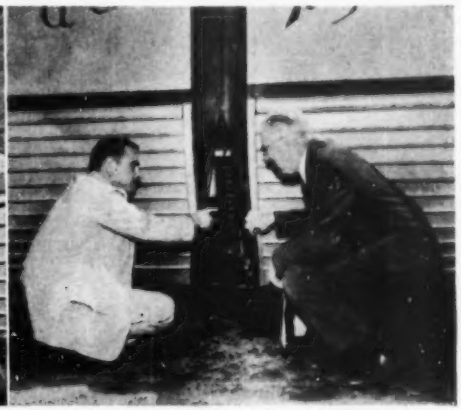
That, in fact, is the whole point. A train of cars, put together in short, articulated units of three, can round curves at high speed and maintain a higher *average* speed than standard trains.

Two of the new trains, fashioned after an experimental model built five years ago (PSM, June '49, p. 136), will go into service on the Rock Island late in 1955.



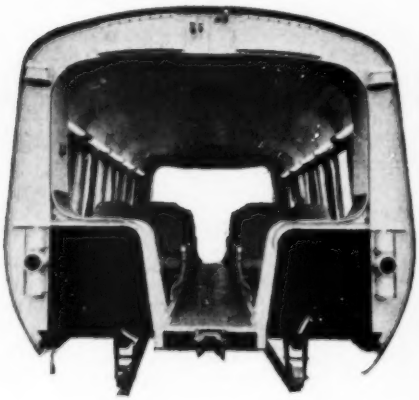
New articulated train, in artist's conception, shows slanting "transition car" behind the engine.

IT'S ONLY A STEP from the middle-entrance coach to a low platform or ground when leaving the Talgo. Four Rock Island triple-unit cars will accommodate total of 300 passengers.



RUBBER APRON joining units is closed by zipper. Wheels, on stub axles, are guided, instead of dragged, around curves. Talgo cars weigh only a fourth as much as like-capacity standard cars.

UNIQUE METHOD of suspending coaches is shown below in opposite-end views of a Talgo unit. On left is "widow" end on dollies that are lowered by hand cranks when units are detached from each other. On right is wheeled, or piggyback, end with two wheels on separate axle stubs. In three-unit "car" one unit has four wheels, the others only two wheels each.



NEXT MONTH . . .

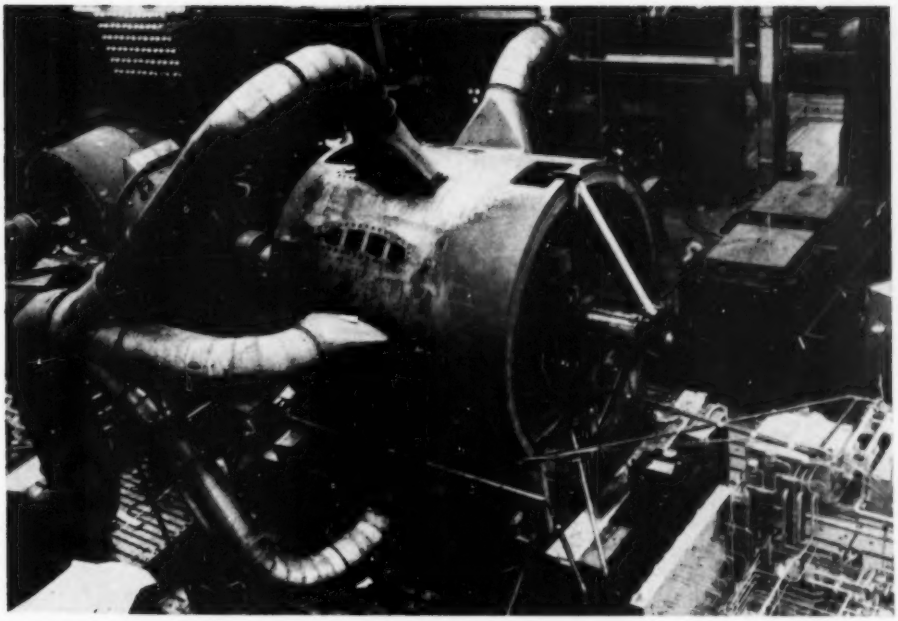
Are 'Woofer' and 'Tweeter' Your Favorite Pets?

Americans are expected to spend $300,000,000 this year for "tweeters" (treble loudspeakers), "woofers" (bass loudspeakers) and other, less colorfully named, components of hi-fi radio-phonograph systems. If you are one of them, or want to be, or are merely curious, be sure to read about this fast-growing hobby in a special section in the October issue of PSM.

Ex-Editor of PSM Wins Top Science Award

Climaxing a career that began over a half-century ago, Waldemar Kaempffert, internationally known science writer, science editor of *The New York Times* and former editor of POPULAR SCIENCE MONTHLY, has been elected to receive the Kalinga Prize. The award, worth $2,800, is given annually by the United Nations Educational, Scientific and Cultural Organization for distinguished science writing. Kaempffert has spent 25 years on the *Times*. He was editor of PSM from 1916 to 1922.

Says *Current Biography:* "No one has done more to bridge the gap between the abstract hypotheses of the laboratory and the mind of the common man."

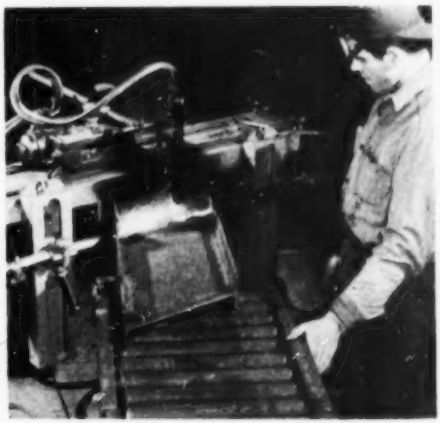


20,000-Hp. Motor Gets Set to Make Big Breeze in Wind Tunnel

TEMPORARY air ducts for ventilation during tests make this big motor look like a giant bug. A 20,000-hp. job, it is one of a pair made for a Pasadena, Calif., wind tunnel. Both electric motors will have fans mounted at each end to whip up winds of 530 to 990 m.p.h. Westinghouse designed them for transonic-speed tests in the tunnel.

Ever See Glasses to Hear With?

WHEN the Englishwoman above puts on her eyeglasses, she can hear better, too. All the parts of a hearing aid—even batteries and microphone—are built into the spectacle frames. Amplivox, Ltd., 2 Bentinck St., London, is the maker.



Gas Jets Cut Steel Fast

THE machine above can slice through a steel beam four times as fast as a machine saw can do the job. Three oxyacetylene torches bite into the steel on all sides at once. The Luria Engineering Co., Bethlehem, Pa., designed the tool for its own use.

Gus Closes a Sticky Case

Deep inside the door of Fenton Wells's limousine, Gus found the key to unlock that arrogant banker's heart.

By Martin Bunn

WHEN Fenton Wells, wealthy and testy financier, drove his big limousine into the Model Garage with Pete Sullivan, his chauffeur, at the wheel, Gus Wilson winced. Wells had a habit of looking over Gus's shoulder while he worked, showing his interest by issuing orders. Stan Hicks, Gus's helper, winked as he sidled away to the grease rack, where he suddenly became very busy.

Wells was a thin lath of a man, with the predatory features of an eagle. He was a widower who lived in a big house on the hill, apart from the town, with his servants and a six-year-old, orphaned granddaughter, whom it was said he idolized. As the financier stepped briskly from the car while Pete Sullivan held the door open, he caught his foot in the folds of a luxurious robe and nearly fell.

Sullivan Gets a Tongue-Lashing

"Careful, sir," Pete said, steadying the man with a hand.

"You clumsy ox!" Wells roared. "Pick up that robe, and be careful with it, if you can."

Sullivan, who had been a sergeant in Korea, turned red to his ears as he bent to pick up the robe.

"It's a wonder," Wells declared angrily to Gus, "that I've a car at all, with this man driving it. The engine misses, the windows won't work, and last night Sullivan smashed a fender."

"I was parked," Sullivan protested, "when a fellow backed into me. I didn't smash the fender, Mr. Wells."

"Didn't smash it?" Wells's voice was caustic. "You could have backed away. You didn't have to sit there, half asleep."

"I couldn't back away," Sullivan said. "There was a car parked tight behind me. I blew my horn—"

"Don't talk back to me, you idiot," Wells warned, "or I'll—"

The Worm Turns

That was as far as Wells got. Pete's control snapped. He grasped the financier by his nose and twisted it.

"By gosh," he said, "I've taken enough from you, you razor-faced old goat."

Gus Wilson moved with amazing agility, to grasp Pete's wrist.

"Drop it, Pete," he pleaded. "Let him go."

"Help!" Wells screamed. "Help me, Wilson!"

"What's going on here?" demanded Officer Jerry Corcoran, dashing into the Model Garage from the street.

"Arrest this maniac, Officer," Wells gasped. "He tried to kill me."

Corcoran's eyes moved to Gus questioningly.

Gus shrugged. "Sullivan only pulled his nose."

"Only pulled my nose!" Wells shouted, dabbing at the rapidly swelling member with a handkerchief. "He tried to kill me."

"You'll have to come with me, Pete,"

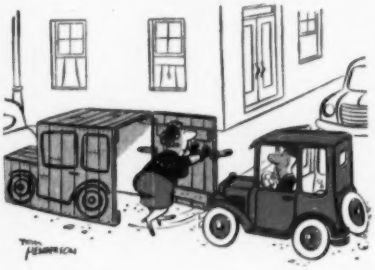
The opening was too narrow for Gus to see into it. There seemed to be no alternative but to tear the door down.

Corcoran said, moving over to Sullivan's side. "And you, too, Wells, to sign the complaint."

"Brother!" Stan Hicks breathed. "Pete's sure in for it now."

"Assault and battery," Gus said grimly. "But why did Pete fly off that way? I've known him since he was a sprout. He's too level-headed and sensible to do such a thing."

Gus thought about it as he went to work on Wells's car. The action hadn't been at all like the Sullivan Gus had known, from knee pants to sergeant's stripes. Still, Gus told himself, Wells was enough to drive a man nuts. He couldn't even keep any help. He either got mad and fired them or they quit. Only the week before, he had fired Marie Lisbeth, the 18-year-old governess for his young grandchild. Not only that, but he tried to have her jailed. He would have, too, if he'd had enough proof.



"Handiest thing you ever made, dear."

Quickly Gus removed the miss from the engine, by installing a new set of spark plugs. He hammered out the small dent in the fender, sanded it smooth, sprayed it with undercoat. While this was drying, he turned his attention to the windows that Wells had complained about.

Window-Control System Is Intricate

The car had an automatic system, operated by electrical energy and hydraulic pressure, furnished by a pump. A master switch by the driver's seat, plus individual switches on each door, controlled the windows.

Gus flipped the toggle switches for the windows and found that only the right front failed to work smoothly. As a routine starter, he checked the fluid in the reservoir, finding it in order. It occurred to him, since only one window failed to work, that this particular switch was faulty. He laid his ear close to the right front door panel and flipped the individual switch. He could distinctly hear the sharp *click* that indicated the switch was activating the solenoid.

This was going to be rugged, Gus told himself. He'd have to tear the entire door down to get at that hydraulic cylinder and the electrical circuit beyond the solenoid. Puzzled, Gus went over to the master switch. He worked the toggles alternately, running the three windows up and down, trying to start the right one. Suddenly all the windows refused to budge. Good grief, Gus thought, if Wells came hotfooting back here and found that instead of fixing one window, Gus had stalled them all, he'd go through the roof.

"If he calls me an idiot," Gus muttered, "I'll—whoops, there I go. As bad as Sullivan." Gus chuckled to himself as he pawed out his pipe, lit it and leaned on the bench.

"You stuck, Gus?" Stan Hicks called.

"Just taking a breather, Stan," Gus assured him.

Now what had stalled those other windows? The answer came to Gus with the thought. A blown fuse, no doubt. In the office he ran a stubby forefinger over the wiring circuit of this particular model, as shown in his shop manual. No, he hadn't blown a fuse. The model was equipped with a circuit breaker. In that case it perhaps had become hot and opened. If so, it should close as it cooled. Gus went back to the car, and when he flipped the switches the three windows again worked.

A gleam of satisfaction came into Gus's eyes. Now, he thought, if he wasn't a fool, this should tell him something. If that right front hydraulic cylinder was working, as the click of the solenoid indicated that it might be, it was deliver-

[*Continued on page 252*]

Carved of mahogany, it's a handsome tray.

Cast in aluminum, it's a hot-foods platter.

MECHANICS *and* HOMEBUILDING

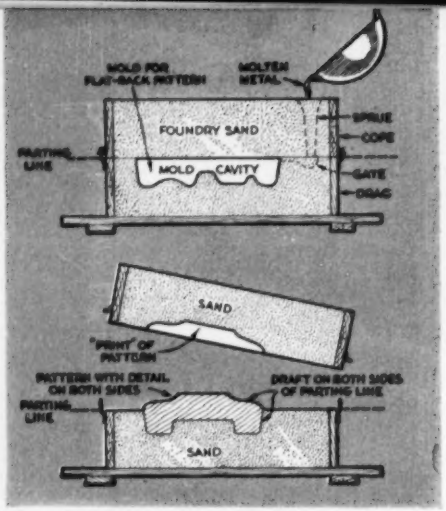
Here's a new twist for woodworkers. Almost anything you turn or carve will serve as a casting pattern if you know the tricks of

Turning Wood into Metal

By John Burroughs

YOU might not think of making a pair of andirons on your bandsaw, turning modern metal legs on your wood lathe, or cutting an aluminum lantern bracket or name plate on your jigsaw. But you can, as easily as if they were of wood.

Fact is, you do make them of wood. Turn, carve or glue up a pattern of anything you want—a copy of something you admire, a duplicate of a missing door handle or other household hardware, or a brand-new design all your own. Take that pattern to a foundry. You can have one or more copies of it cast in non-



THE TOP PATTERN above has a flat back, with all draft or taper going the same way. In the lower pattern, draft goes both ways from a parting line. The mold is made so that this comes where the two sand surfaces meet.

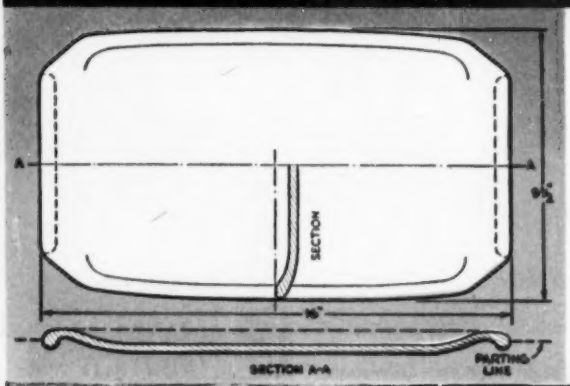
warping, splitproof, everlasting metal.

If well-planned, the casting may require little or no finishing. You'll have done most of the hard work the easy way —on the wooden pattern. Filing, drilling and polishing take care of the rest.

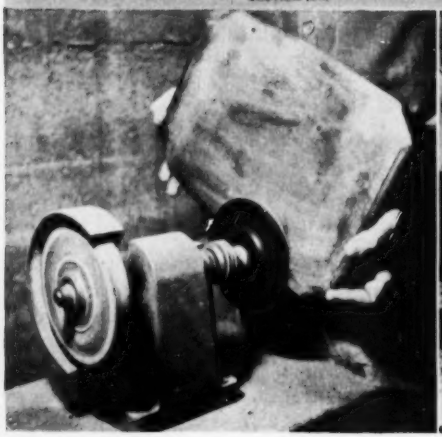
There's another neat stunt you can do. It's to make something of fine wood—a hand-carved leaf tray, for instance—have it cast, and use the pattern for its original purpose as a tray besides.

Find your foundry. Your classified telephone directory probably lists a job-shop foundry in your vicinity. Or you can ask for one at any machine shop. If there is no foundry within easy traveling distance, drop the nearest one a card explaining what you want. Most foundries will make a casting from a pattern sent them, and mail it back to you.

From this carved tray you can have many aluminum platters cast



A PIECE OF MAHOGANY or other nicely grained wood is suitable for this attractive tray. Round the handle ends. The long sides are flat on top, rounded beneath. Gravy grooves can be cut in a branch or leaf-vein design if desired. Coarse sandpaper mounted on a flexible rubber disk (sold for use in electric drills) speeds shaping as in photo at left below. Sand the finished tray smooth, apply a filler if wood is open-grained, and brush on a coat of penetrating sealer as shown below. Use tray pattern to have castings made before you apply the final coating of wax or oil for a finish.



Here are tips on finishing the castings

Brass and aluminum foundries are more numerous than iron foundries, and more likely to accept small orders. Since both these nonferrous metals are nonrusting and pleasing in appearance, they are especially good for home projects.

Wood for patternmaking. Straight-grained, quarter-sawed, air-dried white pine is tops. It's also hard to come by. But any well-seasoned, easily worked wood free of knots will do.

Since you are concerned with shape, not surface appearance, you can build up a pattern in any way that's easiest: by laminating thin stock, using plywood for the flat part and solid stock for sides or ribs, shaping tricky bits out of plastic or fiber, and molding details of putty, composition wood, or auto-body filler.

A good putty for this purpose is made by combining plaster of Paris with ordinary water-mixed plastic-resin glue. Proportions are not critical. The mix sets without shrinking in about 15 minutes, and for several hours thereafter can be carved with a knife. In 24 hours it is dry and rock-hard.

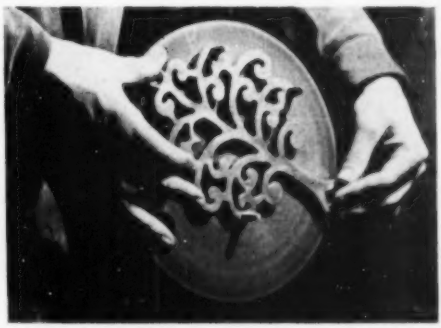
Watch that draft! To make a casting, the foundryman must ram sand around your pattern in a two-part box called the flask. Then he must remove the pattern, leaving intact the cavity it has formed, into which metal is poured.

To be removable from the packed sand, the pattern must taper at least slightly from the surface of the sand to the deepest part of the cavity, as in the drawings on the facing page. This taper is called draft because it enables the pattern to be drawn out of the sand. If the taper runs the wrong way, it will break away the sand.

The easiest kind of pattern to mold has one perfectly flat side and all detail on the opposite side. A wall plaque is a good example. The sand in the top section of the flask will be flat; that in the other half will have a full-depth impression of the pattern.

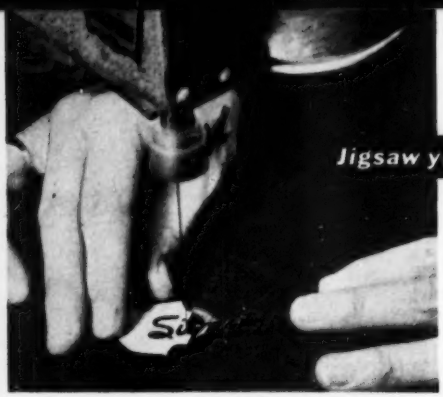
But some patterns must have detail

FOUNDRY CUTS OFF surplus metal formed by sprues and gates, but you may have to file down a little roughness at such points. Here an aluminum crank handle for a small winch is being dressed smooth. A Vixen file with special teeth is best for aluminum. It is a good idea to clean an ordinary file frequently, or embedded chips will soon cause deep scratches.



FLAT SURFACES of castings such as this trivet can be smoothed on a sanding disk faced with Carborundum or Alundum cloth. A disk cut from ¾" plywood can be mounted on a grinder, polishing head or lathe spindle. Affix the abrasive material with sanding-disk cement.

DECORATIVE PLAQUE was cast in aluminum from a pattern carved in plaster of Paris. Details can be smoothed with abrasive cloth by hand, or with a small hand grinder, and buffed to a luster with tripoli on a cloth wheel.



Jigsaw your signature for a branding iron

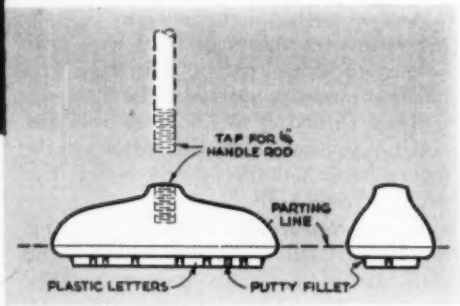
WANT TO BRAND tool handles, luggage, boxes and other property indelibly with your name? Ink it heavily on paper and paste this on a bit of ⅛"-thick sheet plastic. Using a fine blade in the jigsaw, carefully cut out the letters. If any of them should break off no harm is done, but be sure to save the pieces.

PEEL OFF THE PAPER, and cement the cutout name upside down, to read backwards, on a wooden block shaped as in the drawing at right. Then apply glue-and-plaster putty (see text) to all edges of the letters, forming a high fillet that slopes from the top surface to the base for draft. Order a brass, bronze or gunmetal casting. Fit a handle as shown.

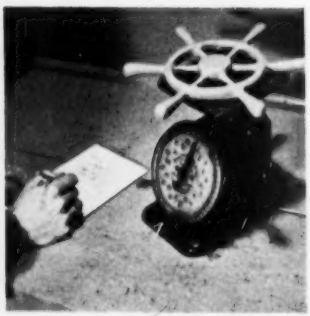
on both sides. These must taper both ways from a common line—called the parting line. It may or may not be at the center of the pattern; the important thing is that the taper goes one way on one side, the other on the opposite.

Draft may be inherent in the shape you want to cast—a ball, for example, has draft every which way from any centerline! A door handle with an oval section will draw from the sand.

The amount of draft may vary from point to point, so long as it is in the same direction. But it should be at least ⅛" to the foot. More will make molding easier, and it may be a good idea to exaggerate draft for your first attempt.



PATTERNMAKING



	ALUMINUM	BRASS	GRAY IRON
Shrinkage per foot of length:	3/16" to ¼"	3/16"	⅛"
Weight (pounds per cu. in.):	.10	.32	.27
Estimating Weight of casting from weight of pattern: Multiply by constant given			
Pine or fir pattern:	5	17	15
Mahogany pattern:	4	13	11

Draft: Minimum ⅛" per foot

FOR YOUR POPULAR SCIENCE MONTHLY INFORMATION FILE

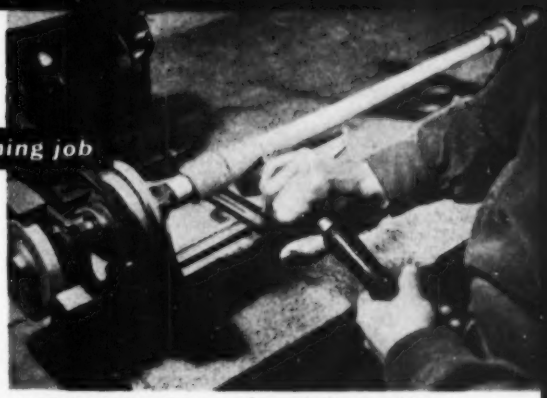
Pattern for metal leg is wood-turning job

Shrinkage allowance. If your casting must be finished or machined to a close fit or exact size, make the pattern a bit larger. Cast metal shrinks on cooling, and if machining is required you'll want to be sure there is plenty left.

Finishing the patterns. Molding sand will not readily hold a sharp corner, and if it breaks away you'll have to chop extra metal off the casting. Therefore it is a good idea to round off sharp corners on the pattern slightly with fine sandpaper. Fill inside corners and angles with smooth fillets, either by gluing in cove molding, or with filler material.

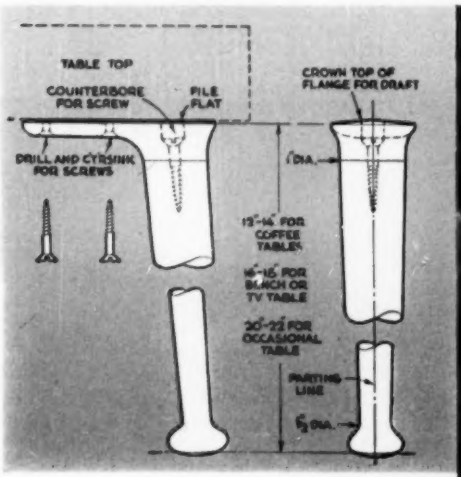
Sand the pattern velvet-smooth—it's easier than cleaning a rough casting. Apply thinned shellac to seal the wood and sand again with very fine sandpaper or steel wool. Three coats of shellac are none too many, as the pattern is subject to dampness from the molding sand. Professionals use yellow lacquer or enamel for the final coat on small patterns.

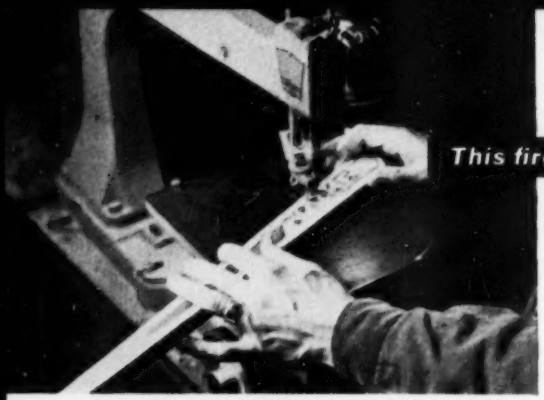
Figuring your cost. The foundry charges by the weight of the metal in the casting—about a dollar a pound for aluminum, less for brass or iron. A rough estimate of the weight of the casting can be obtained by multiplying that of the pattern by a figure given in the table on



MODERN FURNITURE is easily made by attaching cast aluminum legs to plywood tops, flush doors or cabinets. The legs are rugged and lightweight. Turn a tapered pattern from gumwood or maple, with a button on the foot. Saw the top at the desired angle and glue on a wooden block, held on with a countersunk wood screw as below. Fill the screw hole with putty.

SHAPE THE BLOCK with rasp and sandpaper to make the mounting flange. Be sure to crown the top for draft as in the drawing. On the castings, file this surface flat before mounting. Legs can be lacquered or enameled.





LAY OUT THE PATTERN on ¾" pine or other close-grained wood, with name or initials in bold letters joined to the body. Jigsaw out, and round off all parts both ways from the parting line with rasp, knife and sandpaper strips. Note that the ends also are crowned both ways from the parting line for draft.

GLUE THE SPUR, cut from a separate piece, to the bottom of the poker pattern. Build up the thickness of the brush pattern where the bristles will be inserted by gluing ¼" stock on both sides. Make the hanger pattern with a stem that can be cemented into a hole in the fireplace masonry. Enamel the patterns and order brass or aluminum castings, with as many hangers as needed. Drill holes into the bottom of the brush casting. Cement in the tufts of bristles from an old broom or brush.

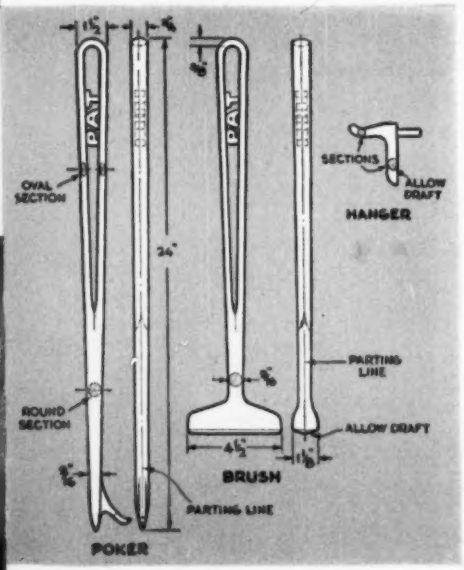
page 198. Most foundries make a minimum charge of a pound for small single castings.

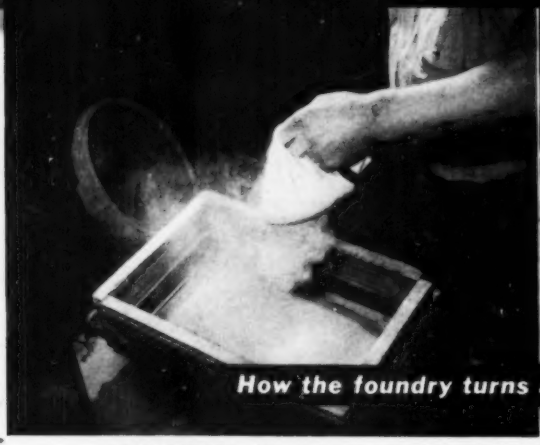
You may be able to save money by making a big pattern hollow; the back of a plaque, for example, can be roughed out to leave a cavity (don't forget this has to have draft too). Book ends might be cast hollow and weighted with scrap.

Cores are cylinders or other pieces of specially treated sand laid in the mold cavity to leave holes or hollows in the casting. Placing these accurately requires extra imprints in the sand, and these must be made by suitable additions on the pattern itself. Better check with your foundry by showing a sketch before you make patterns taking cores.

Don't expect castings overnight; small foundries often wait until they have a number of orders on hand before firing a heat of metal.

You can order as many castings as you wish from a single pattern, a fact worth remembering when Christmas-shopping time rolls around.



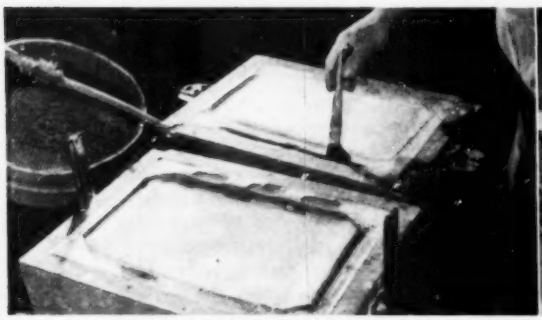


How the foundry turns a pattern into a casting

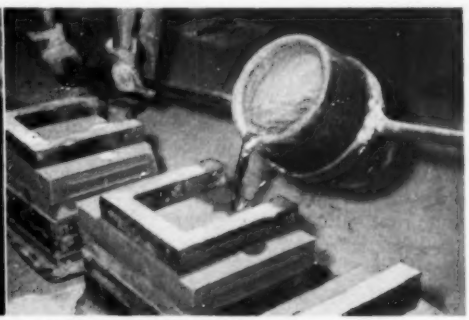
TRAY PATTERN shown on a preceding page is laid upside down on a board. Two pieces of wood the height of the parting line (not visible here) are laid alongside the handle ends. Parting sand is then dusted on as shown.

MOLDING SAND is sifted over the pattern into the drag, or lower box of the flask, and rammed firm. Top is stricken off flush with edges of the drag, which is then turned over, exposing top of pattern as in next photo.

STICKS ARE REMOVED, so that sand surface below them indicates the parting line (above left). The molder carefully cuts away sand to this depth along handle ends. On the long sides, it is left banked up to thickest section, which here constitutes the parting line (center photo). Then the cope or upper box of the flask is set in place, parting sand dusted on, and the cope filled with sand. Pouring sprue is cut in with a tube as at right above.



COPE IS LIFTED OFF and the pattern carefully removed. The molder cuts channels from the pouring sprue to the cavity and dampens sharp edges with a brush to strengthen them.



COPE IS REPLACED and weighted down so that the poured metal will not float it. Aluminum is poured and, when cool, the mold is dumped and casting removed as on page 195. END

Give your old-fashioned mortar box and hoe the one-two-three with this

Midget Cement Mixer

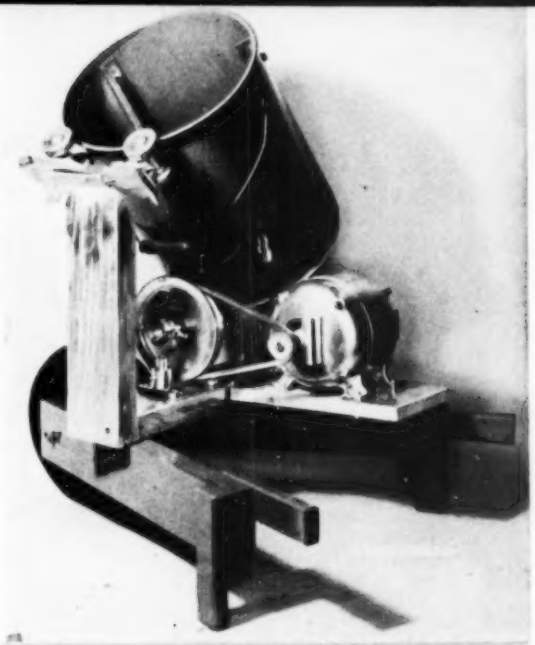
NEED a small batch of cement or mortar to cast flagstones, trowel up a backyard barbecue, or puddle the basin for a pint-size reflecting pool? Here's a midget mixer that will turn out "mud" as fast as you can use it on small jobs around the home acre.

Far less expensive than commercially built mixers, this little fellow is easy to put together, takes almost no space in the tool shed, and can be trundled up to almost any working site. Best of all, its mixing drum lifts off the turning mechanism to become a carrying and pouring bucket.

Mixing drum. The midget is built around a discarded five-gallon paint bucket. To convert the bucket into an efficient mixing drum, three strips of 1" aluminum angle stock are bolted to its inside walls. The angles agitate the mix and stiffen the bucket.

Base. A wheelbarrowlike base supports the drum at a 45° angle and provides a mount for the motor and turning mechanism. Its main horizontals are two-by-sixes. Drilled

TWIRLING THIS MIXER are an old shop motor, three pulley wheels and a belt, two self-aligning hangers, a length of ½" shafting, a floor flange and a roller skate. The drum (a paint bucket), lifts off plywood turntable for carrying. Wheelbarrow base is handy but the unit is light enough to be carried. Drawing shows mounting of turntable and roller skate; photo below it, how a taped V pulley drives the turntable.

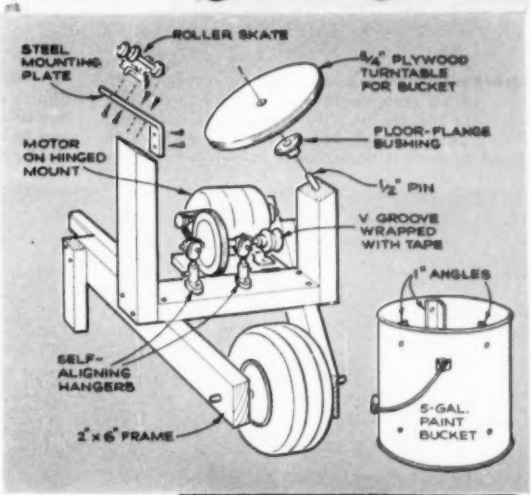


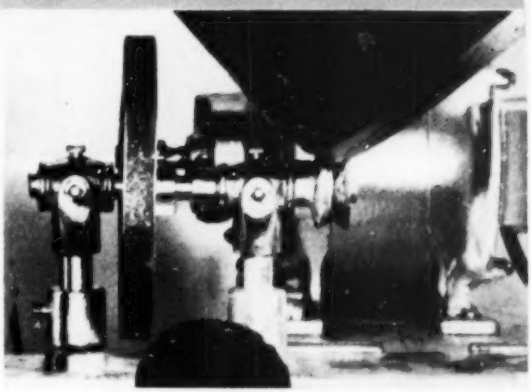
to receive the axle of a pneumatic-tired wheel at one end, and supported by short legs at the other, the horizontals are held in rigid alignment by a sturdy cross member that is situated just behind the wheel.

Attached to one end of the cross member is an upright with a mitered top. A 1½"-diameter pin is press-fitted into a hole in the sloping top of the upright. The pin leans inboard at an angle of 45° and serves as a pivot for a plywood disk that supports the bucket. The disk is just large enough to allow the rolled seam at the bottom of the bucket to slip over it. Washers on the pin, and a bushing made from a reamed-out floor flange, let the disk turn freely.

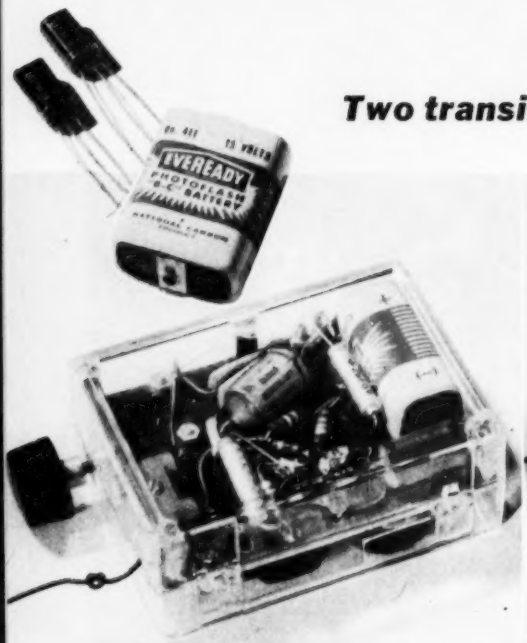
Directly opposite the disk, a second upright holds an inverted roller skate at an angle of 45°. The skate provides a roller contact for the upper end of the inclined bucket, and helps to support it.

Turning mechanism. To rotate the bucket, a motor is mounted on a base hinged to the cross member. The motor has a 1½" driving pulley, which is belt-connected to a 6" driven pulley turning between self-aligning hangers on a ½" shaft directly below the bucket. Outside one of the hangers, on the side nearest the bucket-supporting disk, there is another 1½" pulley. The V groove of this pulley is faced with a number of layers of friction tape, and is so placed that when the motor is running it grips and turns the bottom edge of the disk. The pulley ratio provides a bucket speed of from 60 to 100 r.p.m.—ideal for grinding out cement or mortar in a hurry.—*Richard Day, Monee, Ill.*

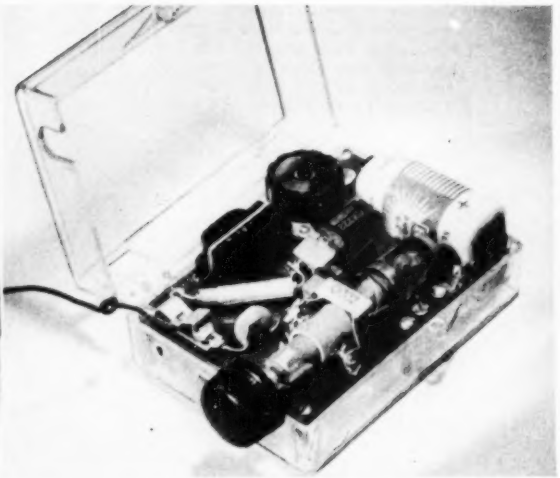




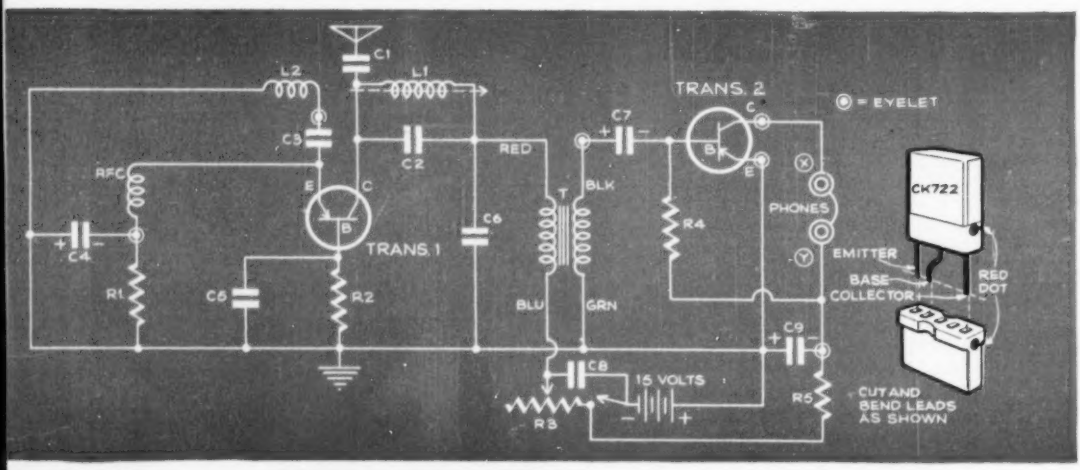
Two transistors pack unusual volume



UNDERSIDE VIEW shows tight assembly. Both ends of all components are securely fastened, enabling the set to withstand rough handling. Wires pass through holes in panel or are soldered to eyelets or terminal lugs.



WITH THE CASE OPEN, battery is easily replaced. Phone tips enter socket through holes in lower box section. Lid is notched around tuning shaft and for regeneration control knob. Ground wire can be added if desired.



PARTS LIST

L1, L2: Loop-antenna replacement (Vari-Loopstick) with added winding
T: Interstage transformer (UTC SSO-7)
RFC: 500 microhenry RF choke (Millen J300-500)
C1: 47 mmfd. ceramic (CRL DD-471)
C2: 300 mmfd. ceramic (CRL DM-301)
C3, C6: .001 mfd. ceramic (CRL DM-102)
C4, C7, C9: subminiature electrolytic, 2 mfd., 6-volt
C5: .25 mfd., 200-volt subminiature paper (Aerovox type P82)
C8: .1 mfd. 200-volt (same type)
R1, R2: 10,000 ohms, ½-watt carbon
R3: ½ meg. subminiature variable with switch (CRL B16-218)
R4: 250,000 ohms, ½-watt carbon
R5: 12,000 ohms, ½-watt carbon
Tr1, Tr2: Raytheon CK722 transistors
Miscellaneous: two 5-prong subminiature sockets (Cinch 2H5), crystal socket for phones (Cinch 2KB), 15-volt miniature battery, 1/16" linen Bakelite panel, plastic case, tuning knob and bushing, 2-56 bolts and nuts, lugs, eyelets, etc.

All parts, including tested transistors, sold by Federated Purchaser Inc., 66 Dey St., NYC 7.

and battery life into this

Pocket Radio

Step-by-step drawings and wiring instructions make it easy to build this lively little tubeless receiver.

By Howard G. McEntee

PACKED into a 3″ fishing-tackle box along with this midget radio are a few surprises. The first is ample earphone volume—you can enjoy listening even in noisy surroundings.

The second is sensitivity. In the wee hours, you may pull in stations halfway across the country. At the beach, on picnics or camping trips, the set will deliver almost any station on the dial.

You'll have to wait for the third surprise. It's more battery life than you would dream of getting from a tiny 15-volt flash-gun battery. No need to stint on listening; this little can of juice should last for upwards of 100 hours.

Transistors do the trick. No subminiature tube could deliver that kind of economy. But transistors work on as little as a thousandth the current tubes need.

The Raytheon CK722s used are low in price (about $4.50 each). Not every CK722 you may buy will oscillate in the regenerative detector circuit. However, the source given in the list of materials will sell pairs of these units, one of them tested and identified as a detector.

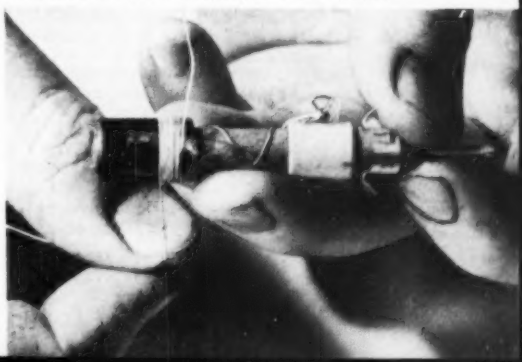
Add a tickler winding. The first step in construction is to modify the loop-antenna replacement used for a tuning coil. This has a ferrous core on a threaded shaft. I jammed a threaded bushing on the shaft, and fastened a knob on the bushing. In doing this, make sure the core will screw in to within 1/16″ of the end, to tune in the low frequencies.

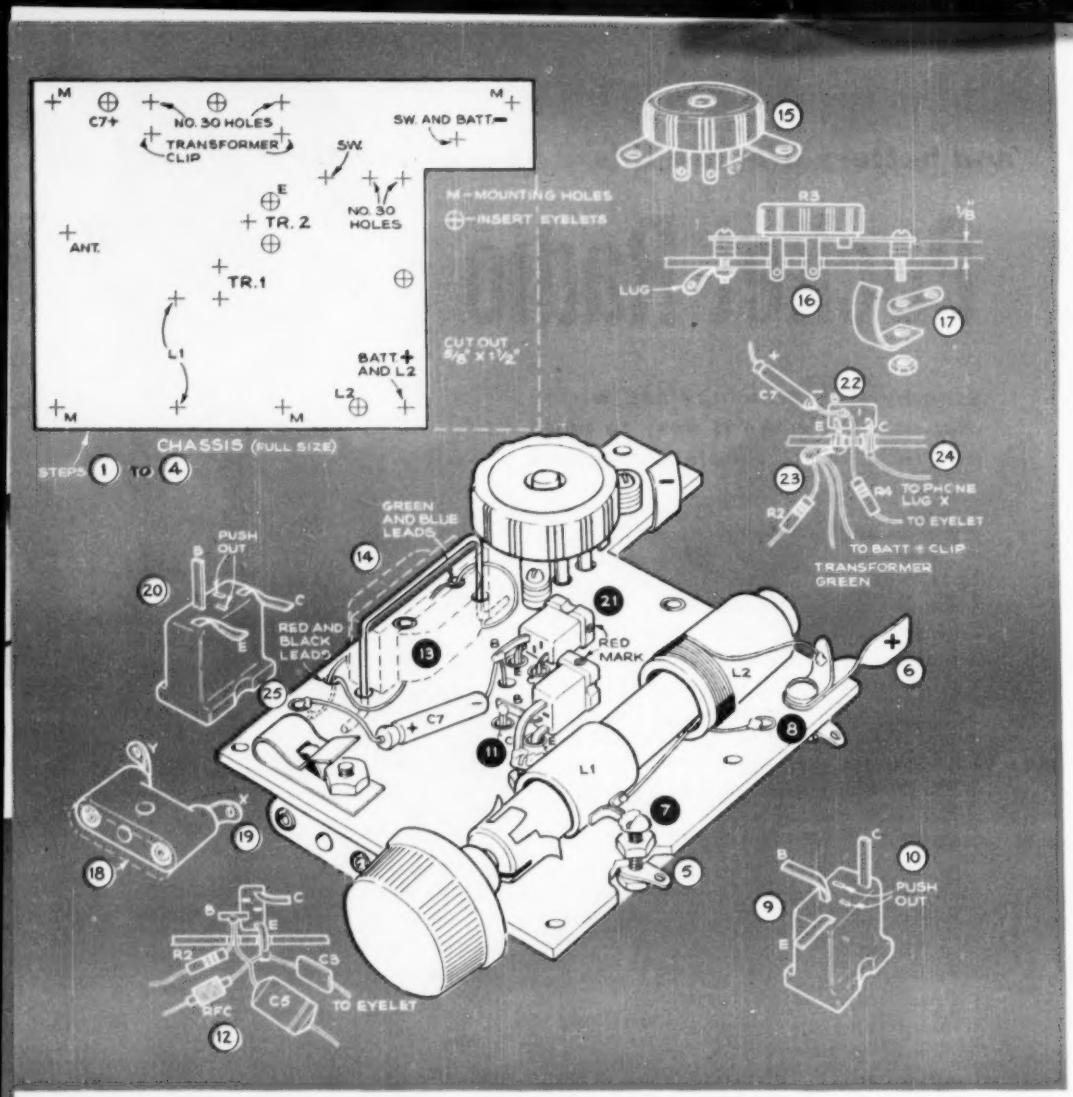
Unwind the short length of wire attached to one of the coil terminals, cut it off, and wind it over one end of the coil sleeve for L2 as shown below.

Fit chassis to case. The chassis or panel was fitted inside a 1″-by-2″-by-2⅞″ plastic fishing-tackle box. Four 7/16″ lengths of ¼″ Bakelite rod were tapped 2-56 and cemented into three corners and midway of the front edge.

[*Text continued on page 264*]

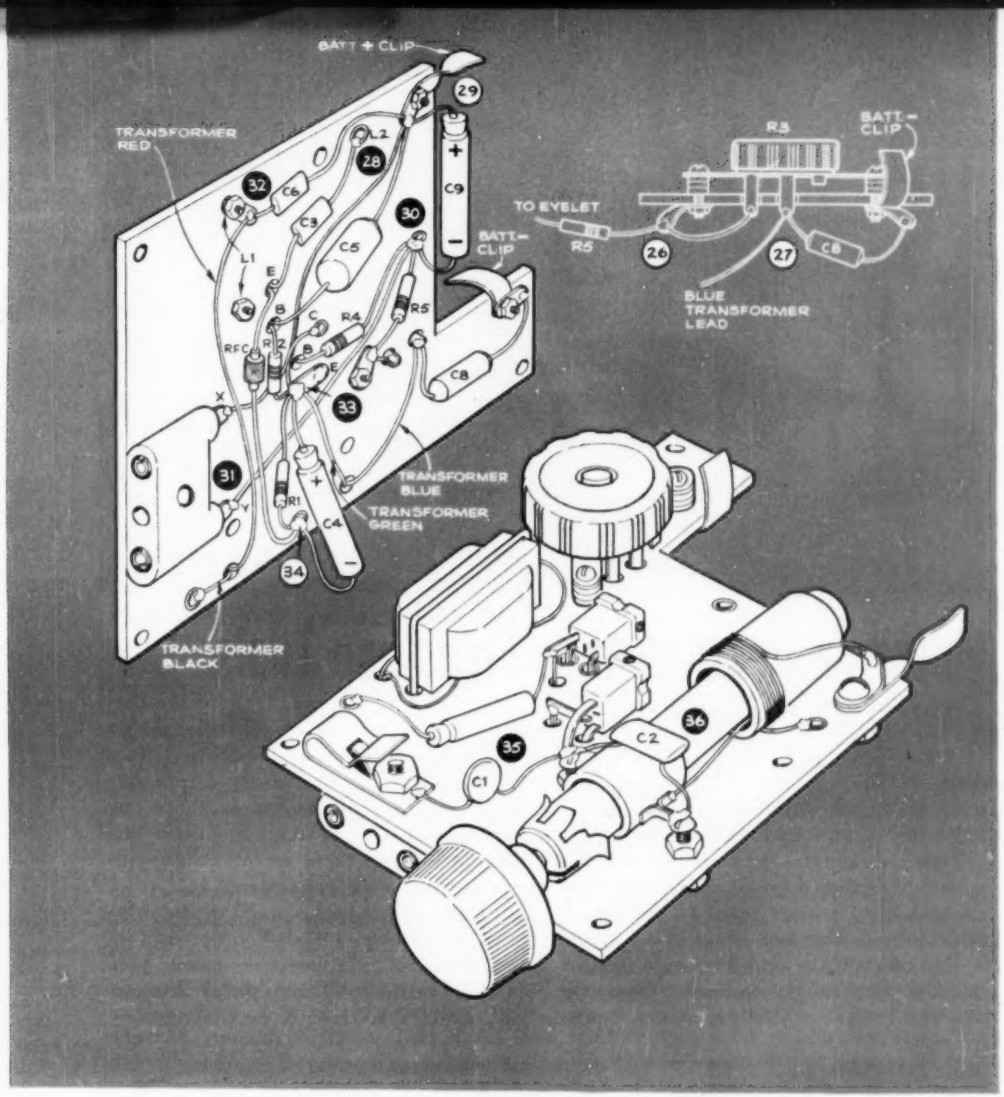
AN EXTRA WINDING is added to an iron-core loop replacement unit like this. Cut loosely wound length of fine wire free of the coil terminal it is soldered to and wind it over one end of the coil, taping ends securely. *(For steps in building the pocket radio, turn the page.)*





STEPS IN BUILDING THE POCKET RADIO

1. Cut 2" by 2⅞" panel from 1/16" linen Bakelite. Cut out battery notch.
2. Prick-mark holes from full-sized drawing.
3. Drill holes No. 42 except four marked No. 30.
4. Set eyelets in circled holes, using a punch. Crimp a lug under E eyelet (Tr. 2) below panel.
5. Mount 2-56 bolts 3/16" above panel in L1 holes with two nuts on each. Put lug under panel on bolt near edge.
6. Bend positive battery clip from sheet metal. Assemble with lugs on bolt above and below panel.
7. Solder L1 coil terminals to screw heads.
8. Solder L2 leads to eyelet and top lug.
9. Bend B and E prongs of one socket 90° as shown.
10. Twist and push out two prongs indicated. Paint a red dot on collector (C) side.
11. Insert E prong in Tr. 1 hole nearer coil. Solder C prong to nearby L1 terminal.
12. Push one lead of R2 and C5 through hole from below and solder to B prong above. Solder one lead of RFC and C3 to E prong below panel.
13. Mount transformer on top of panel with wire clip, bending ends of clip beneath panel.
14. Pull coded transformer leads through holes.
15. Cut one end lug of R3 short as indicated.
16. Mount R3 ⅛" above panel with a 2-56 bolt (at left), washers, and a lug under the nut.
17. Bend negative battery clip, clamp it and a lug under nut of second R3 mounting bolt.
18. File end of phone socket down to end of inserts. Squeeze inserts to grip phone tips.



19. Drill bolt hole through socket. Bolt it on below panel, with antenna clip under the nut.
20. Twist and push out the two prongs of Tr. 2 socket indicated. Bend C and E prongs 90 deg.
21. Mount socket by soldering E and C prongs into Tr. 2 eyelets.
22. Run one lead of R4 through hole between eyelets from below panel. Solder it and negative lead of C7 to B prong above panel.
23. Solder free end of R2, green transformer lead, and a 1¾" length of wire to E lug.
24. Solder 1¼" wire to C prong and phone lug X.
25. Solder positive lead of C7 to eyelet (near corner) above panel, and black transformer lead to same eyelet below the panel.
26. Join end lug of R3 and nearer switch terminal with a short wire. Solder one lead of R5 to lug on terminal.
27. Solder blue transformer lead and one lead of C8 to center lug of R3. Solder free end of C8 to negative battery lug.
28. Solder free end of C3 to L2 eyelet.
29. Solder positive lead of C9, free end of C5 and of wire from E lug of Tr 2, and one lead of C6 to positive battery lug.
30. Solder negative lead of C9, free ends of R4 and R5, and 2"-long wire to eyelet.
31. Solder free end of 2" wire to phone lug Y.
32. Solder free end of C6 and red transformer lead to lug on L1 terminal.
33. Solder plus lead of C4 and one end of R1 to lug on E prong of Tr 2.
34. Solder free ends of C4, R1, and RFC (refer to step 12) to eyelet behind transformer.
35. Solder one lead of C1 to antenna clip.
36. Solder free end of C1 and one lead of C2 to L1 inner terminal, and free end of C2 to outer L1 terminal.

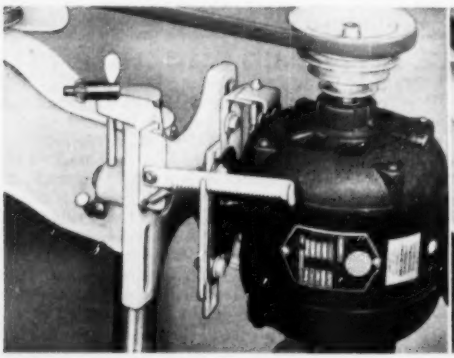
Motor on Bracket Runs Five Shop Tools

YOU'VE just ripped out a fine slice of oak on the table saw and now you're ready to run in a rabbet on the jointer, some curlicues on the jigsaw, then a few holes for screws on the drill press.

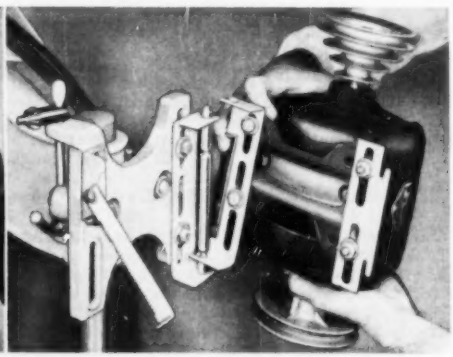
That would take—let's see, 10 seconds apiece to switch the motor to each tool—about half a minute total to set up all three jobs in the new shop above.

The secret, a quick-change motor bracket that simply unhooks from one tool and hooks on another, makes it possible to run a whole shopful of machines with a single power source—and do it fast enough to make costly duplication unnecessary. A new idea in shops, say the makers, it lets you buy individual tools, and keep them set up to go without fussing with conversions.

The five basic tools—an 8" tilting arbor saw, 4½" jointer, 14" drill press, 15" jigsaw, and 27" lathe—cost about $240. They're made by Duro Metal Products Co., 2651 N. Kildare Ave., Chicago.

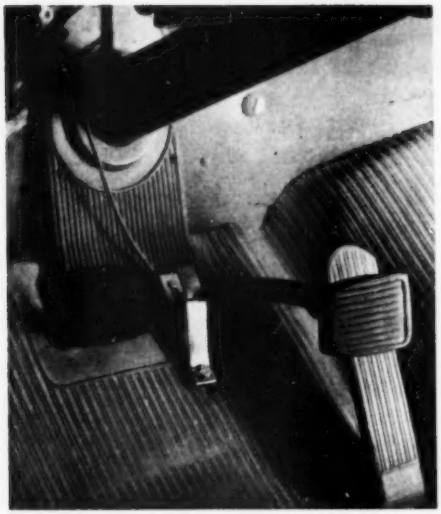


PIVOTED MOTOR rides on pin at one side, is locked tight by toothed bar on other that can be set anywhere to keep proper tension on belt. Each tool comes with identical mount, can be run by any ½-hp. double-end-shaft motor.



TO REMOVE MOTOR, spring tab is pulled out of groove in pin and motor is slipped up and off pivot. Dual mount for saw has sliding carriage that moves with arbor, permits quick switch to jointer by shifting belt to other end.

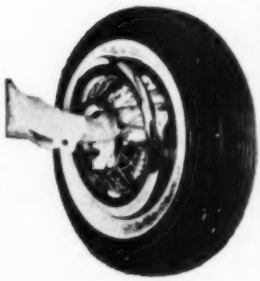
New for Your Car



1. Safety Switch Warns of Low Brake Pedal. Your horn will tell you that it's time to have your brakes adjusted if you mount this switch on the floorboard beside the pedal. Pedal height diminishes slowly and often is not noticed, but when your pedal rides low enough to touch this switch, it sounds the horn. If the brakes should *suddenly* fail, the horn will blast before you have time to think of it.

2. Terminal Connectors Spare Battery. No hammering or special puller is needed to install or remove these two-piece battery-terminal connectors. The bronze castings squeeze tightly over the battery posts and cables when the bronze clamp bolt is tightened. Loosening the clamp bolt allows the two halves to separate easily.

3. Wash Without Water. Clean up on the spot after making a roadside repair or changing a tire, with this convenient wash-up kit that needs no water. The kit contains 24 packets of a creamy cleansing material and paper towels. Squeeze the contents of one packet on your hands, rub them together and wipe clean with a paper towel.



4. Wire Wheels Snap Out for Cleaning. These wire wheels snap out to let you clean the wheel beneath the spokes. The clips are driven between the rim and the tire bead with a hammer, without deflating the tire. Extra clips are included for the spare wheel.

5. Top-Tinted Glasses Ease Night-Driving Glare. Nod your head slightly when glaring headlights come into view and shield your eyes with the tinted area of these nighttime glasses. See clearly when the headlights have passed by looking straight ahead through the lower part.

Further information on these new car products can be obtained from: 1. Rite-O-Way Products Co., 17886 Hull, Detroit 3; 2. Gun Tool Mfg. Co., 373 Columbus Ave., New Haven, Conn.; 3. Sugar Beet Products Co., Saginaw, W.S., Mich.; 4. Udylite Corp., 1651 E. Grand Blvd., Detroit; 5. Jordan White, 3543 Center View Ave., Wantagh, N.Y.

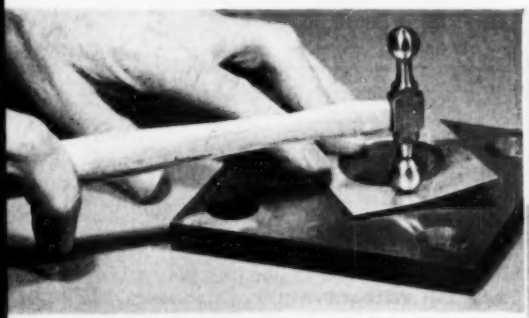
7 Uses for Ball-Bearing Balls

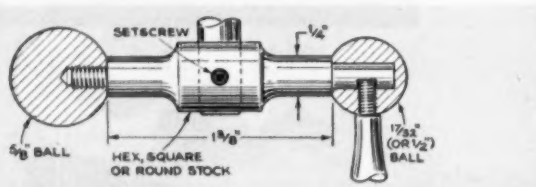
These polished steel spheres, available at little cost, punch, cut, burn, and—for the kids—even roll around.

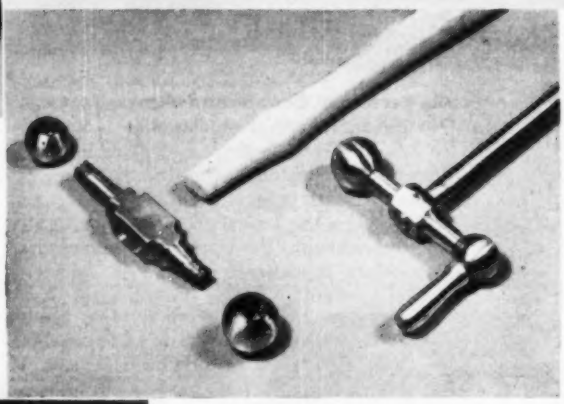
STEEL balls from junked ball bearings, just about the world's most perfect spheres, can do a lot of new jobs after being retired from antifriction work.

Select balls that are uniformly bright. Made of high-carbon steel, they must be softened before you can work them. Do this by heating to a glowing red and letting them cool at room temperature.

For punches, hammers and similar tools you must restore the hardness. Heat the ball to a moderate (cherry) red and plunge it quickly into cold water. Test with a file. If the steel has been hardened sufficiently, the file will not bite into it. Temper the ball (to reduce brittleness) by polishing a spot and reheating slowly until the spot becomes a yellow-brown. After the heat is removed, the color will continue to change. If it ends in a blue color, no further heating is necessary. If it doesn't, apply more heat very carefully.—*Walter E. Burton, Akron, Ohio.*

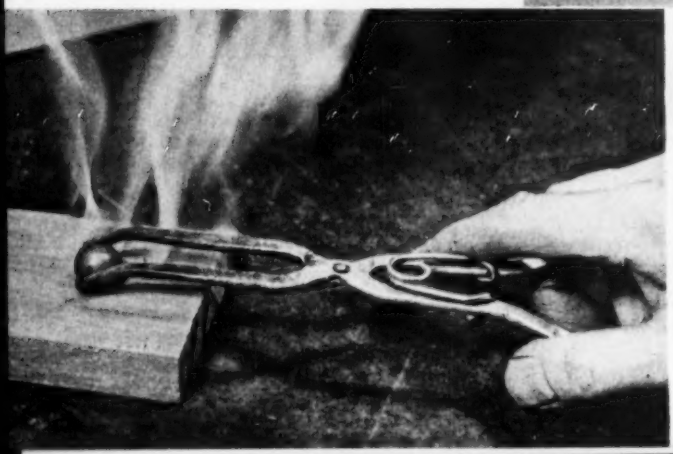




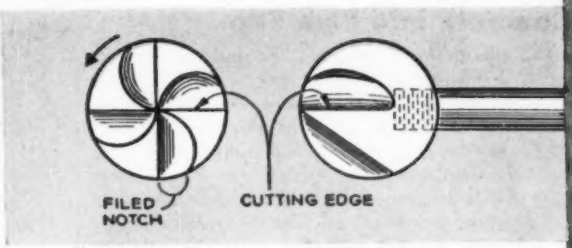


1 BALL-END HAMMER was made from ½" and ⅝" balls mounted on a machined low-carbon steel head. Joints were threaded, but could be tapered. The handle is hickory.

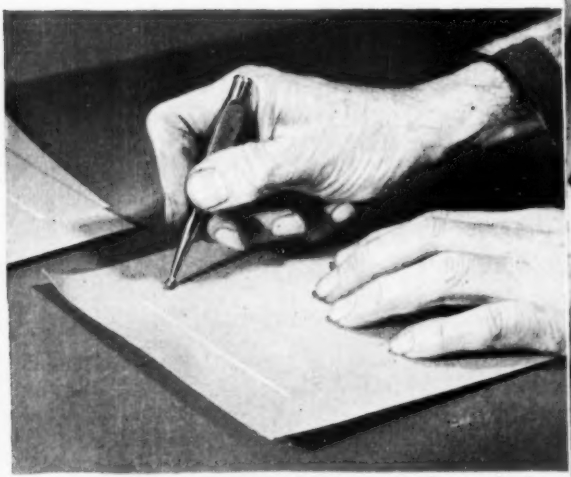
2 TO MAKE DIMPLES for finger grips in drawers or slides, heat a steel ball to a red glow and burn in a recess in easy stages. Then merely scrape away the charcoal.



3 MACHINE CRANK is made much like hammer head (above left). A hex-bar crosspiece holds ½" and ⅝" balls. Smaller ball has two holes, one threaded for 1" handle. A 6-32 setscrew secures crosspiece to ¼" shaft. Ball-crank cutaway—which can also be used for guidance in making hammer—is shown in drawing on top.



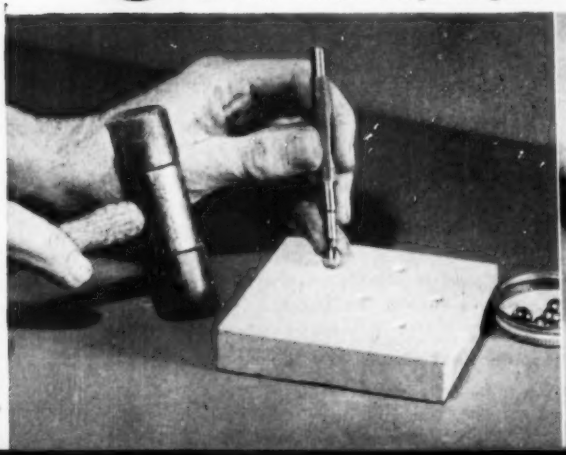
4 **SPHERICAL CUTTER,** shown in use at right, is a ½″ ball, thread-jointed to a ¼″ shank. Cutting edges are four notches cut by file. Be sure to center hole on rotating tools.

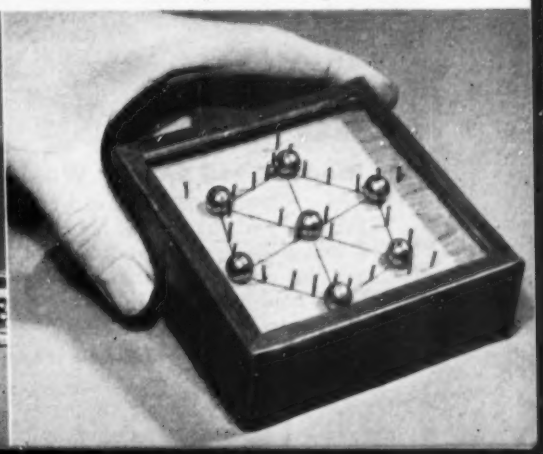


5 **EMBOSSING TOOL** can be made by brazing a ⅛″ steel ball to an old nail set. To get a raised-panel effect, place a thin cardboard under paper and rub tool against its edge.

6 **ANY SIZE BALL** can be used to make a punch. Hex bar is 3/16″ stock, taper joined. This particular punch was used to form shallow depressions in block of wood for a pinball game.

7 **PINBALL GAME** can be made with ball bearings. A wooden block with seven depressions in it is enclosed in a sheetmetal frame with glass top. Brads help make the game harder.





Footings Made by Pouring Concrete into Flue Tile

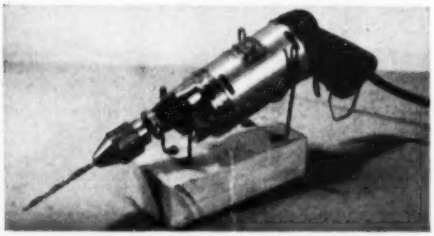
CONCRETE footings for light structures can be made without erecting wood forms by placing clay flue tile on an underground base of rock or concrete. Pour the concrete into the liners and allow it to set, making the liner a part of the pier. Use square liners with rounded corners. These come in a wide range of sizes and can be easily cut to length with an abrasive cut-off wheel in a power saw, or by scoring with a cold chisel and breaking off the excess.—*Joseph D. Campbell, Wood River, Ill.*

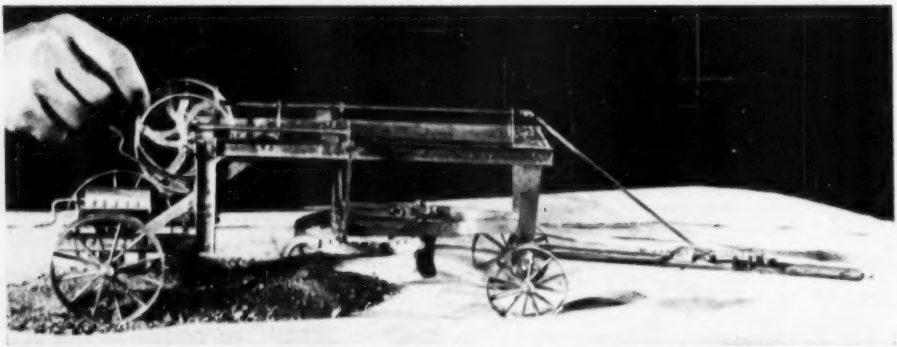
Nails and Tape Hold Oilstone

KEEP an oilstone from slipping by driving two nails into the bench at the opposite corners of the stone and wrapping tape or a large rubber band around it.

Wire Rack Supports Drill

BEND two pieces of clothes-hanger wire and fasten them to a block of wood, as shown at right, to support a power drill when it is not in use. In this way the tool's body won't be scratched by dirt or chips on the bench, and the drill in it can't be accidentally bent or broken.—*Louis Hochman, Sherman Oaks, Calif.*



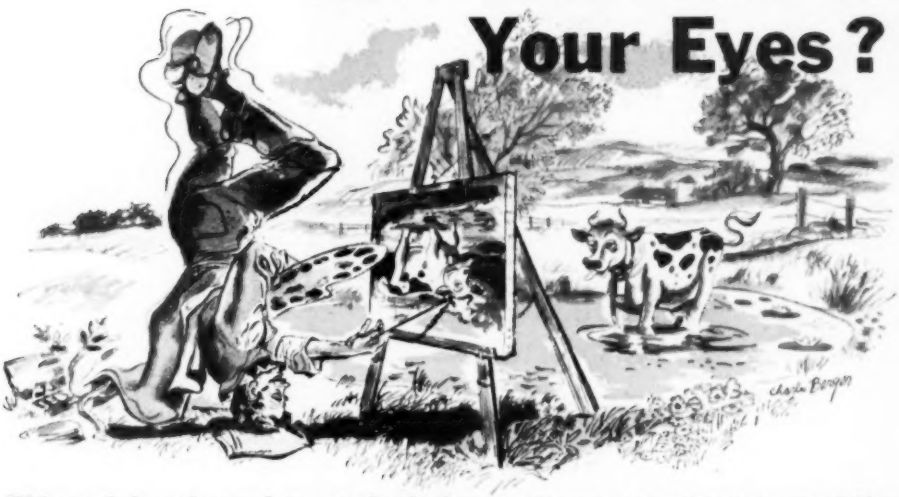


This Model Road Grader Would Just About Fit Tom Thumb

WORKING with a file, hacksaw and grinding wheel, Herbert E. Fey and his brother of New Braunfels, Tex., spent five months producing this 23½"-long model of an old horse-drawn road grader.

Wheel hubs, worm gears and pinions were hand-cut from tire-valve stems. The wheel spokes are coat-hanger wire. Turning the control wheel, as shown in the photo above, adjusts the blade.

Can You Believe Your Eyes?



This quick quiz on how and what you see may amaze you, and the answers will show you some simple stunts to amuse your friends.

By Kenneth M. Swezey

YOU don't see purple cows when you stand on your head. But did you know that the world looks much brighter when you see it upside down? That's because your eyes grasp color faster than unfamiliar forms. Normally, you take the color for granted and concentrate on form and motion. But when you suddenly see things topsy-turvy, the color jumps right out at you.

Surprised? Then check your knowledge of simple optics with the six questions below. If you are wrong, don't let the answers on the next two pages drive you to your oculist. Strange and imperfect machine that it is, the human eye is still the world's best camera.

EYE QUIZ

1. Balanced Vision
With normal eyesight, you
(a) see equally well with either eye
(b) have better vision in one eye
(c) see better with one eye at night, the other in daytime

2. Side Glances
Looking out of the corner of your eye, you see everything in
(a) natural colors
(b) chartreuse
(c) gray

3. Perception
In your field of vision you see
(a) nothing in some areas
(b) flying saucers only when they are directly in front of you
(c) everything with equal clarity

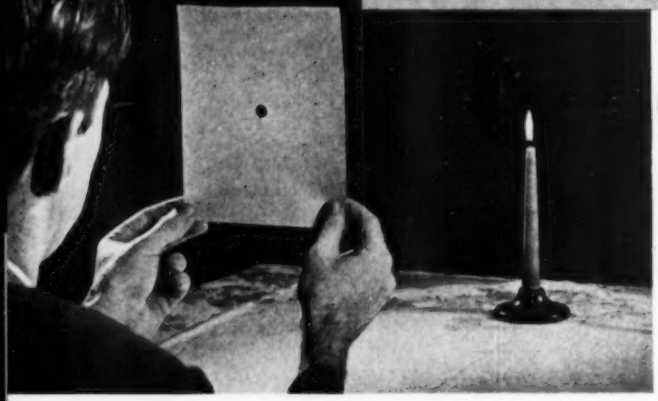
4. Focusing
The depth of sharp vision of your eyes increases when you
(a) wear sunglasses
(b) train your eyes to move in and out like a camera bellows
(c) look at objects in bright light

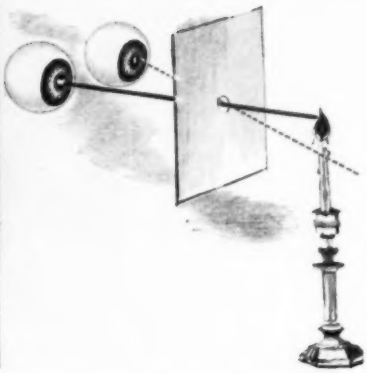
5. Night Sight
After dark you see best
(a) out of the corner of your eye
(b) looking straight at an object
(c) with your eyes shut

6. Topsy or Turvy?
Optically, you see everything
(a) right side up with one eye, upside down with the other
(b) upside down
(c) right side up

Please turn the page for Eye Quiz answers.

Answers to Eye Quiz on Preceding Page

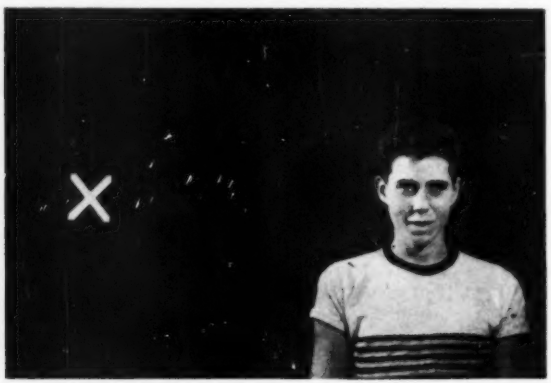




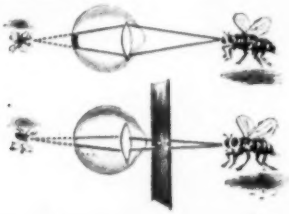
1. If you have normal eyesight, you have better vision in one eye (answer: b). To prove it, hold a sheet of paper with a half-inch hole in its center about a foot in front of you. Using both eyes, sight through the hole at a distant candle. Without moving the paper, look again—first with only your left eye open, then with your right eye. One eye will still see the candle; the other will not. Whichever eye sees it is your leading eye. You are right- or left-eyed, just as you are right- or left-handed.

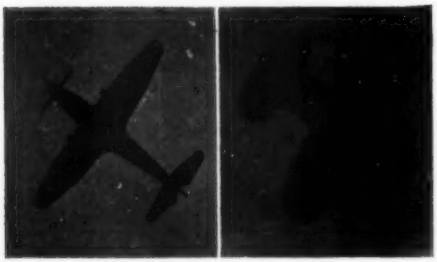
2. Looking out of the corner of your eye you see everything in gray (c). You have two light-receiving sets in your eyes. The small, central areas of the retinas are made up of about seven million cone-shaped receptors which are sensitive to color. Surrounding them are some 130 million rod-shaped receptors which are totally color-blind. To prove it, look straight ahead while moving a colored book into the periphery of your vision. As long as the image falls on the cone-receptor area you will see it in its normal color. But when the image reaches the rod receptors it will appear gray.

3. In your field of vision you see nothing in some areas (a). Although you are not conscious of it, there is a blind spot on the receiving screen, or retina in each of your eyes, at a point where the optic nerve is attached. Ordinarily these blind spots don't trouble you, because each eye fills in the field of vision blanked out by the other. But if you close your right eye and stare at the picture of the boy, at the same time moving the picture forward and backward, you will find a point at which the cross at the left disappears from view. Similarly, a cross to the right of the boy would disappear with the left eye closed.



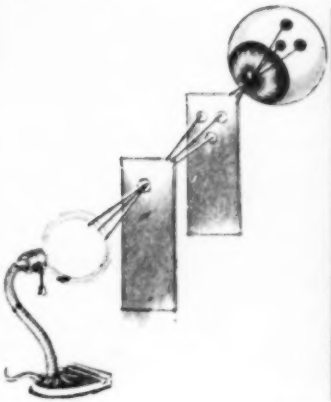
4. The depth of sharp vision of your eyes increases when you look at an object in bright light (c). Any shutterbug can tell you that when he stops down the lens to its smallest aperture, his camera turns out pictures which are in sharp focus from the objects nearest him to the horizon. The same thing happens when the pupils of the eyes contract to compensate for bright light. To exaggerate the effect, look through a pinhole at a finely detailed object held only three or four inches away. Features which would normally be blurred stand out sharply. The diagrams show why. Without the pinhole, a normally expanded pupil admits light rays to a large area and, in spite of great adjustability, the lens focuses these light rays at a point behind the retina. Where the converging light strikes the retina, there is a blurred image or "disk of confusion." Because the pinhole narrows the cone of light, the disk of confusion is small, and the image is therefore sharp.





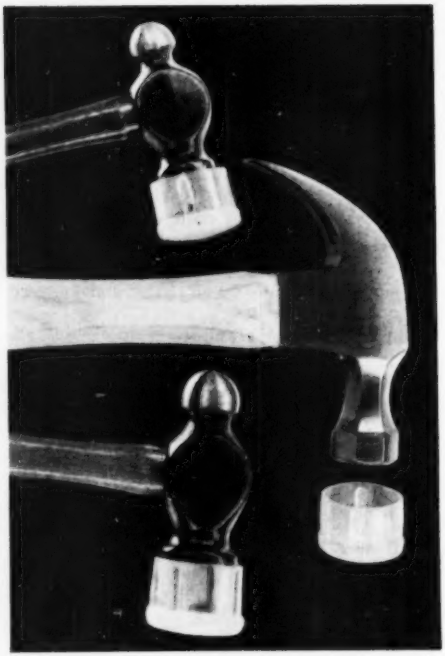
5. After dark you see best out of the corner of your eye (a). As stated in answer 2, you have two sets of receptors in your eyes. In addition to being color-conscious, the cone receptors can resolve detail better than the rod receptors, and you use them for all normal daytime viewing. However, the rod receptors are much more sensitive to dim light. To distinguish planes against a night sky, pilots and plane spotters make use of these rod receptors by rotating the center of their vision in a small circle around the objects they want to identify.

6. Optically, you see everything upside down (b). Like camera lenses, the lenses in your eyes invert images in the process of projecting them back for recording. By some mysterious process, the brain does a flip-flop with these inverted images, restoring them to normal. Whatever the process, you can trick your mind into seeing an inverted image by punching three small holes about 1/16-inch apart in one strip of cardboard, and a single hole in another, as shown in the photo. Sight at a light through the holes in the two strips, holding the triangle of holes close to your viewing eye and the single hole an inch or so in front of it. The triangle will appear upside down!



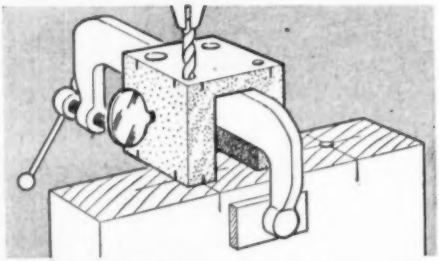
New Tools

1. Tool Hanger. Hang portable power tools out of the way over a bench, but ready to be pulled down when needed. The retractable reel (left) is balanced to support the tool, suspended from the lower loop, yet a gentle pull brings it down.



2. Marproof Hammer. Any steel hammer can do the work of a plastic or rawhide "soft" hammer when fitted with a nylon hammer-head cap. The cap permits tapping parts into position without marring them and is also useful for forming sheet metal over hardwood forms.

3. Screw Clip. Working in tight spaces is easier with this clip that holds socket-head screws on the hex wrench while you install them. It is also useful for holding hex keys in place when they are left in the screws for adjusting jigs or machine-tool accessories. The clip keeps the keys from being thrown out.



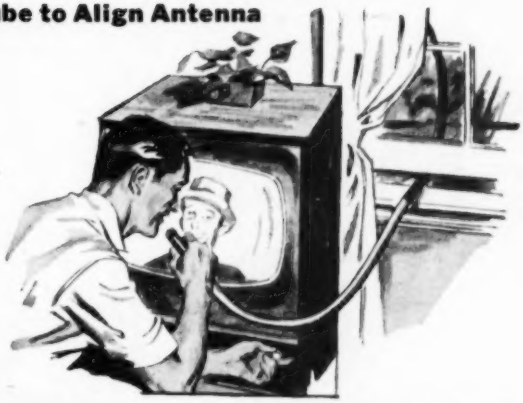
4. Dowel Jig Adjusts Two Ways. Accurately placed holes can be drilled on the edge, end or surface of any size board with this drill jig that locks itself on a C clamp or bar clamp. Two center marks for each hole permit quick alignment of the jig to the layout marks on the work.

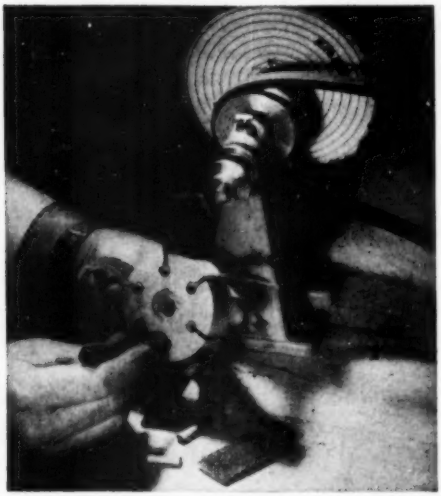
5. Drill Extension Is Bendable. Impossible drilling jobs take only a little longer with this drill extension. It has a flexible joint that allows you to bend it into the position needed. Drills are held in special extension chucks marked for the corresponding drill number.

Further information on the tools shown on this page can be obtained from: 1. Benjamin Reel Products, Inc., 10700-10710 Broadway, Cleveland 5, Ohio; 2. Lempco Automotive, Inc., Cleveland 27, Ohio; 3. Vlier Engineering, Inc., 4552 Beverly Blvd., Los Angeles 4, Calif.; 4. M. D. Lee, P.O. Box 22, Irondequoit Br., Rochester 17, N.Y.; 5. Beaver Tool Co., 622 East Jericho Turnpike, Huntington Station, N.Y.

Hose Used as Speaking Tube to Align Antenna

INSTALLING a new TV antenna, my brother and I shouted ourselves hoarse between rooftop and living room to get it aligned for best reception. I was wishing for phones such as servicemen use, when I recalled a stunt we enjoyed as kids. So we ran the garden hose out of the window and up on the roof. Talking through this, we were able to line up the antenna in a jiffy.—*Ervin W. Schrader, St. Louis, Mo.*





Revolving Strips Sand Curves

SIX strips of abrasive cloth set into a wooden drum will smooth contours and carvings that no other power sander will touch, or quickly round and soften edges.

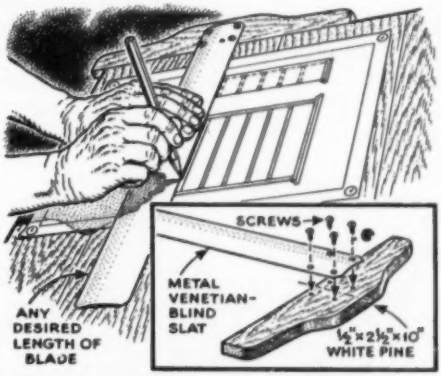
Cut a section off a hardwood rolling pin or turn a piece of maple ⅞″ wide by 2⅜″ in diameter. Bush the existing hole, if necessary, to fit your arbor. Mark off six spaces and drill 5/16″ holes ½″ from the edge. Saw ⅛″ kerfs through to the holes.

From aluminum oxide cloth (not paper) or a sanding belt, cut 4½″-long strips. Double them over, abrasive out, and force them into the holes by inserting a tapered tool from both sides as shown. Then push in pieces of ¼″ dowel. When one side of the strips is worn, simply reverse the drum on the arbor.

Ring Binders Hold Shop Prints

TO KEEP blueprints clean, flat and in plain sight, hang them from old ring binders screwed to a wood strip on the shop wall.—*Philip E. McCafferty, Stanwood, Iowa.*

▶▶▶ Short pieces of garden hose slipped over the handles of cutters or pliers will cushion your grip and protect your hands when you're doing prolonged or heavy work. They give a better hold, too.—*Gilbert C. Close, Hawthorne, Calif.*

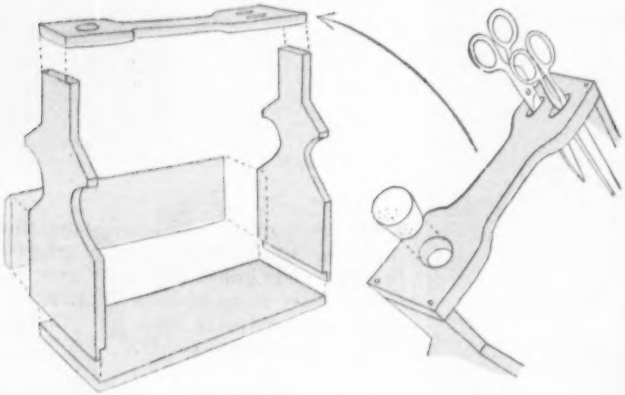


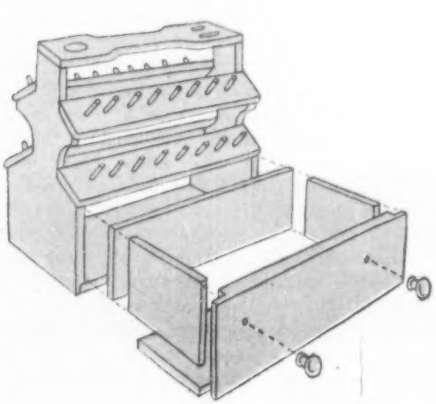
Metal Slat Makes a T Square

YOU can make a useful T square from a metal Venetian-blind slat. Screw one end square to a tee shaped from a scrap of white pine.—*T. A. Yurkey, Erie, Pa.*

By Roy Doty and W. K. Towers

Wordless Workshop





Next Month: A handy carrier for firewood.

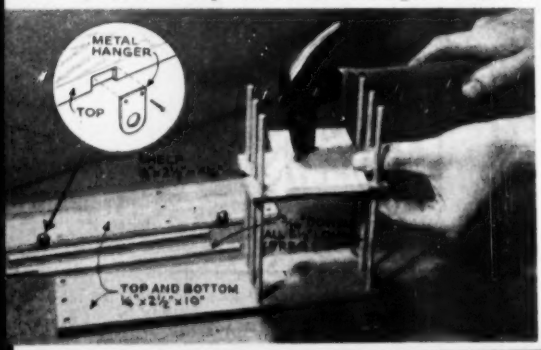
One Evening Shop Projects

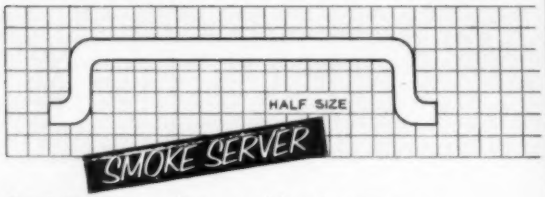
Miniatures are popular, and here's a shelf to match them. Nine dowels and a few scraps of ¼" plywood are all it takes.

For easy assembly, cut the small shelf and drill the six holes ¼" from opposite edges. Identify one face and one end, and clamp the shelf to one end of the bottom piece. Use it as a jig to drill six blind holes here, then shift it to the other end to drill the other three holes.

Clamp the shelf to the underside of the top to spot the holes in it also, but with its other face in contact. This will match up any variation in hole spacing. Sand the dowels before assembly. Shellac or varnish makes a pleasing light finish.—*Walter E. Burton, Akron, Ohio.*

GLUE DOWELS into bottom holes. Then drive on the shelf until it is 2¼" down. Secure it with brads through edges, insert end dowels, and drive on top. Mount metal hangers as shown.



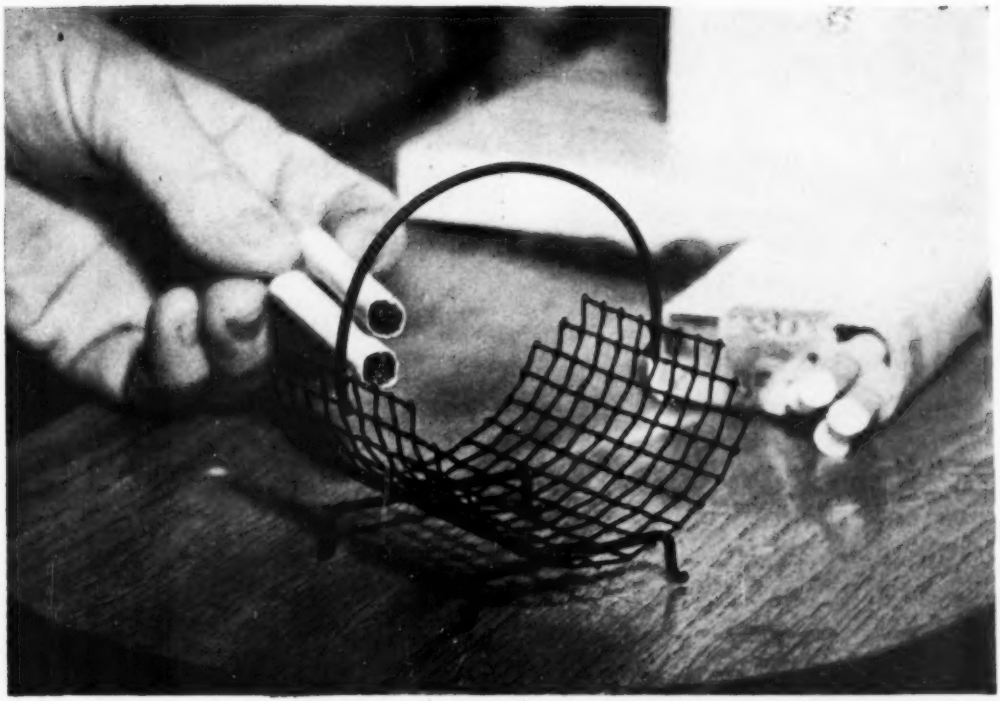


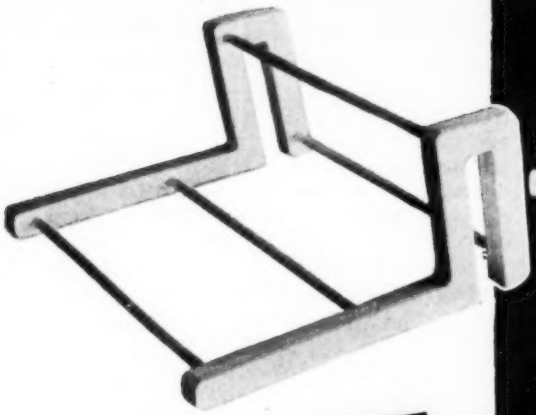
Coat-hanger wire readily becomes a cigarette tray in the modern black-iron mode. Remove all paint from the wire with steel wool or emery cloth and bend two legs, 2¼" long, as shown at right.

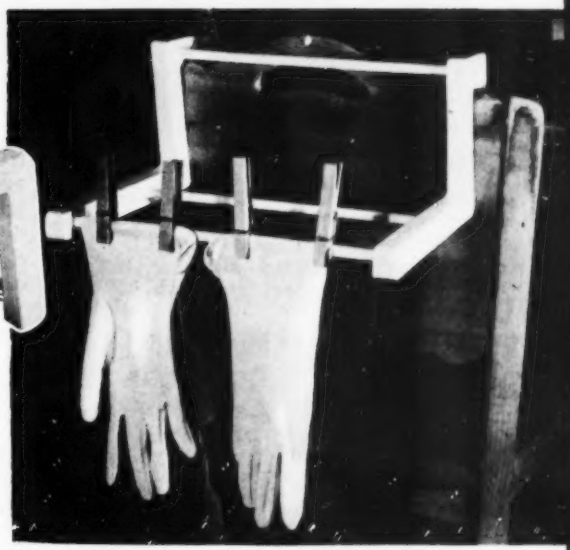
Shape the handle around a 2¾" can or rolling pin. Bend a 2¾"-by-4¼" piece of ¼" mesh hardware cloth to the same curvature, cut off the corners, and file all sharp points smooth. Solder together with acid flux, washing all joints well afterward. Finish with dull black lacquer or enamel.—*Clifton Morris, Lubbock, Tex.*

It's an easy wicket to convert old croquet balls into smartly simple candlesticks. For the base of each, saw a 4¾" disk out of ¾" stock and sand the edges. Drill and countersink a small hole at the center of the dish. Inspect the ball for flaws, selecting the poorest area to be the bottom, and flatten a small area at that point.

Fasten the ball to the disk with a flathead wood screw and a little glue. Bore a 13/16" hole 1" deep for the candle socket. Fill any cracks, finish with varnish or enamel, and glue a felt disk to the bottom.—*Victor H. Lamoy, Upper Jay, N. Y.*

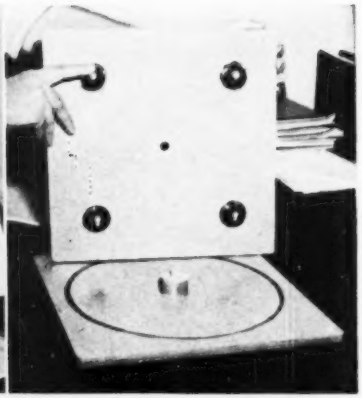






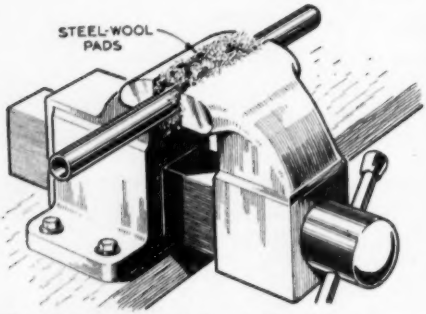
CHAIR-BACK DRIER

Pint-sized laundry hung on a chair like this to dry won't clutter up towel bars. Try a cardboard pattern of the rack sides on the back of the chair for fit. Then trace this shape on ¾" plywood and cut out two identical pieces. Clamp them together to drill ⅜" holes for the four dowels through both parts at once. Glue in the dowels. Finish with three coats of enamel to resist dampness.—*Jim Miller, Moline, Ill.*



Lazy Susan Lets Desk Mates Take Turns on the Same Machine

REVOLVING on ball casters around a central pivot, this swivel base makes one office machine conveniently available to two people sitting on opposite sides of a desk. The use of four ball casters set in ½" plywood gives the machine sturdy support combined with a low center of gravity.—*W. G. Waggoner, Sacramento, Calif.*



Steel Wool Protects Tubing

CUSHION pipe or tubing with pads of steel wool next time you must grip them in the jaws of a vise. The steel wool provides a slipproof hold without excessive pressure. —*Hugh Lineback, Stillwater, Okla.*

Hose Serves as Sanding Block

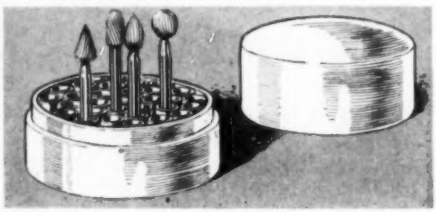
SLIT a short length of garden hose and wrap it with sandpaper, tucking the ends into the slit. With it, you can sand irregular surfaces or contoured edges without digging in or sanding off high spots. Pressure of gripping the block keeps the sandpaper tight.—*G. C. Close, Hawthorne, Calif.*

Sash Pulleys Do Other Jobs, Too

SASH pulleys from your odd-parts box can be used as regular pulleys in a pinch. Supported by loops of heavy wire or chain run through the center hole, they will stand fairly heavy loads.—*Hugh Lineback, Stillwater, Okla.*

Drinking Straws Hold Drills

ORDINARY drinking straws, cut into ¾" lengths and stacked in a round or square box, form a handy holder for drills, burrs or other small tools.—*Frank Shore, NYC.*



You Can Make Your Own Rubber Stamps

Here's a perfect kitchen-table job—you even cook the rubber in your oven. It's fun to do, too.

A SPECIAL stamp that will cleanly reproduce a signature, drawing, bookplate, or any legend in type that you want can be made at home on the kitchen table. You don't need special tools, and you don't need to be skilled at lettering. Better yet, you needn't spend the cash that a custom-made stamp costs.

Making a rubber stamp yourself is interesting and kind of fun.

You use vulcanizing inner-tube patching rubber—the stuff a garageman vulcanizes over a puncture with a heated clamp. Ask him to let you have a few square inches of hot-patch rubber, not the cold-patch kind. This gives lasting, springy stamps of red rubber that will print any copy or drawing you choose, in any size. If you are ambitious, you can even make special stamps for post-card printers or business duplicating machines.

The trick is to vulcanize the rubber in a plaster-of-Paris mold. Clamp pressure and curing in the kitchen oven do the job. One of two slightly different kinds of molds may be needed, depending on whether you wish a drawn design—a signature, for example—or a stamp that prints lines of type.

Chalk-plate mold. This is your dish if the stamp is to reproduce a signature or any freehand lines. A device old-time printers used, it consists of a metal plate covered with a thin, even coating of plaster. The coating should be about 1/16" thick. Pencil your design lightly on it, just as you wish the stamp to print—no mirror-image gym-

nastics are needed. Then scribe each line down to the metal underneath, using a keen knife or pointed stylus. (I ground a three-sided point on an old nail set.)

Type mold. For this, obviously, you'll need some type to begin with. Most printers with linotype machines can be coaxed into running off a slug or two for you. If you wish good-sized letters, you may be better off with regular printer's foundry type, and sometimes you can arrange to borrow what is needed for an hour or two. Another possibility is the type that comes with youngsters' printing outfits.

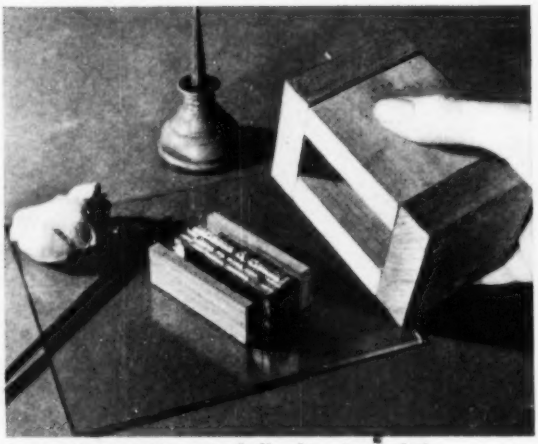
Casting a block of plaster against the type creates your mold. Oil the type lightly, enclose it in a retaining box, and brush on a thick plaster mix. Work the plaster against the letters to eliminate air bubbles. You can take the type out as soon as the plaster has set, but let the block dry for at least a day more.

Cooking your stamp. Use moderate clamp pressure to hold the rubber against its mold. About four hours in an oven set at 250° will vulcanize the stamp. Take it easy when you peel the vulcanized rubber from its mold. It generally comes away cleanly from a type block, but a chalk plate will probaby break up and you may have to pick the pieces out of the stamp.

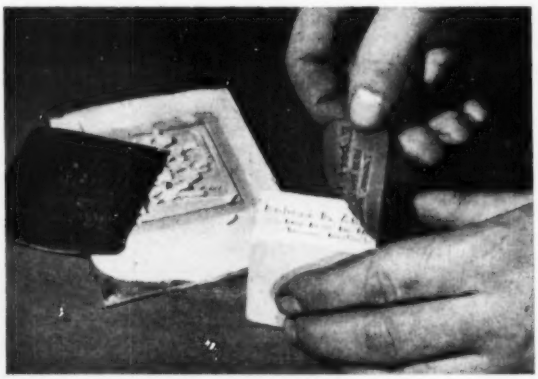
Use thinned rubber cement to attach the molded rubber to the bottom of a flat (*really* flat) block of hardwood. Handles can be whittled or lathe-turned, or you can use dime-store replacement pot-lid knobs. If you are as proud of the stamps as I think you will be, finish them off with two coats of gleaming black enamel. Then hide them away from the youngsters—let them make their own!—*John Burroughs.*

THIN LINES OR FAT come out neat and clean if you ink the stamp correctly and then apply it to the work without any rocking or skidding.

1. BUTTER A COATING of plaster on a metal plate. When it is dry, use a sanding block to cut coating down to an even 1/16" thickness.



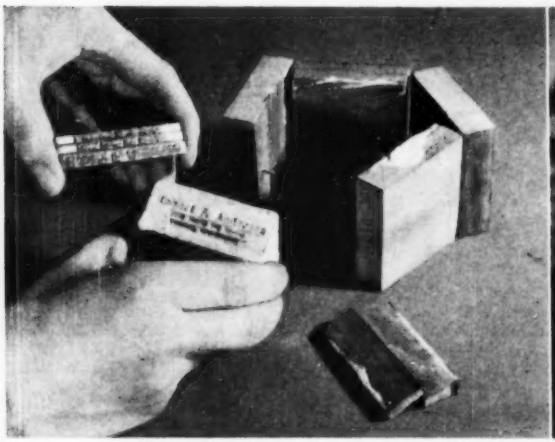
4. IF TYPE IS USED, no chalk plate is needed. Assemble type to uniform height in a snug, open-ended box. Brush on plaster mix.



7. EASY DOES IT when you peel the cured rubber off the plaster. Chalk plate usually crumbles but the type mold will stay whole.

2. PENCIL THE DESIGN you want right on the plaster. Then, using a V-pointed tool, scribe the lines right down to the metal beneath.

3. CUT HOT-PATCH RUBBER to cover the face of the chalk plate. Peel off the coating and blow out any plaster dust within the mold.

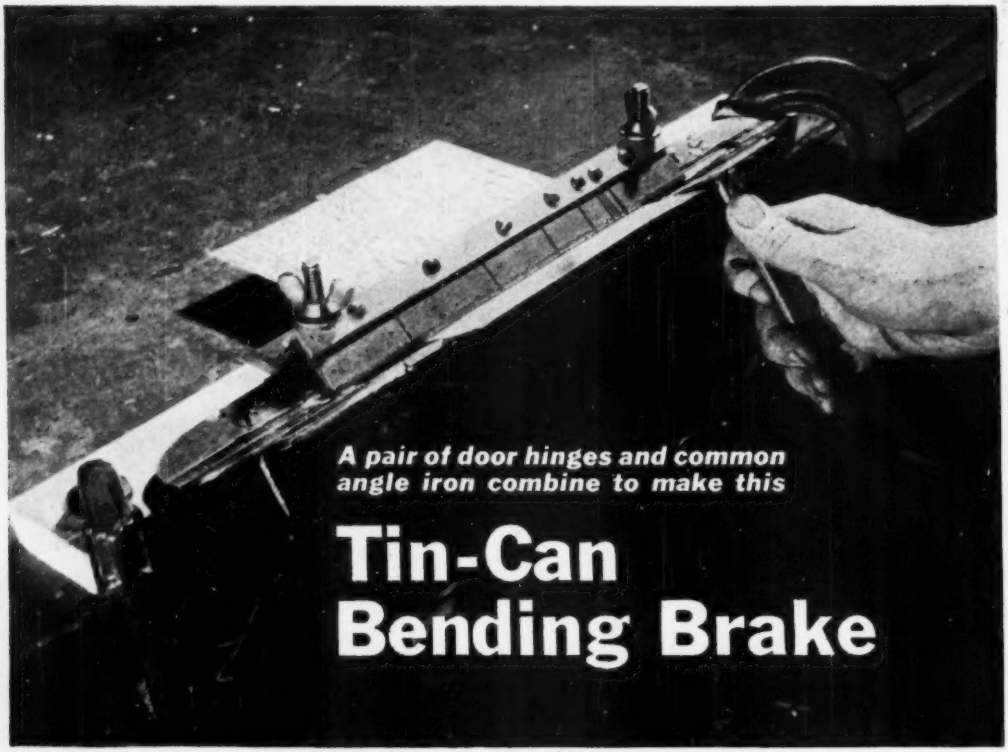


5. TYPE MOLD looks this way after plaster has set. Be sure a block of plaster like this is thoroughly dry before heating it in oven.

6. ASSEMBLE SANDWICH consisting of mold, rubber, square of aluminum foil, and flat metal or wood. Cook four hours at 250°.

8. YOU DON'T WANT LUMPS in the cement that holds rubber to wood block. Be sure, too, that block is dead flat, without grain ridges.

9. HANDLED AND PAINTED, the finished stamps look like custom-made ones. More important, they work just as well. END



A pair of door hinges and common angle iron combine to make this

Tin-Can Bending Brake

BENDS ARE A BREEZE to make with this hand brake. The adjustable bar clamp on top holds sheet metal firmly down on the stationary bed; the front bar pivots up to form the bend. Any light sheet stock up to tin-can thickness and 7½" in width can be shaped.

WITH a bending brake, shaping sheet metal becomes a pleasure. From tin cans you can make trays, model parts, housings for gadgets, and other things.

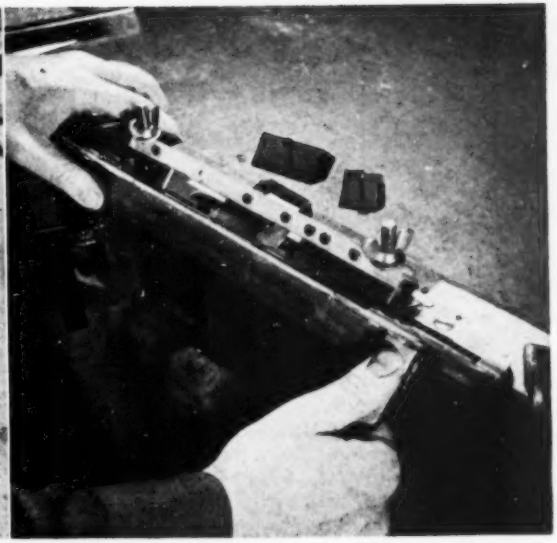
This little brake will make shallow boxes, reverse bends, and even 180° fold-overs. It is easily built of a pair of heavy hinges and some angle iron.

Knock the pins out of the hinges and saw the leaves as in the drawing. The original pins are usually loose; cut new ones from stock that will be a drive fit. Turn or grind a sharp point on each pin, centering it accurately. Force the pins in until the points project inside the hinges.

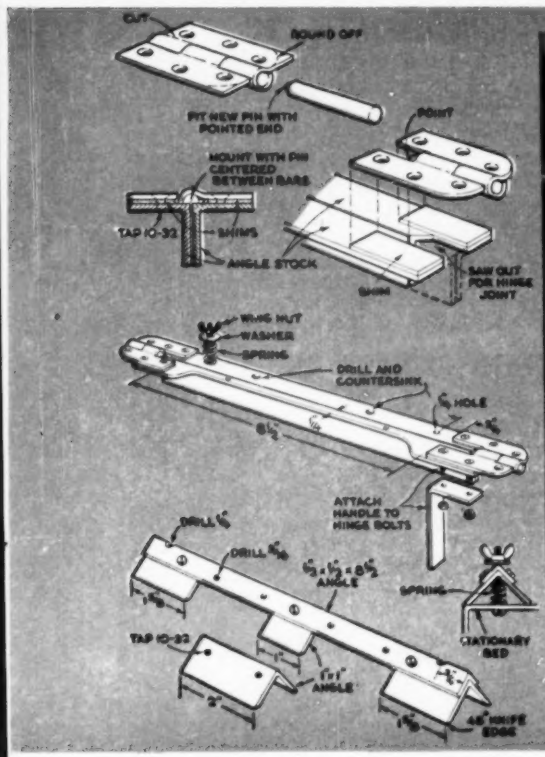
Clamp two straight pieces of 1"-by-1" angle side by side after filing any high spots until the edges touch all along. Clamp on the hinges with the points of the pins exactly on the line between the angle irons, using shims if necessary. Drill through the hinges and tap the angle stock for bolts. Properly mounted, both angle bars should remain in constant contact as they pivot.

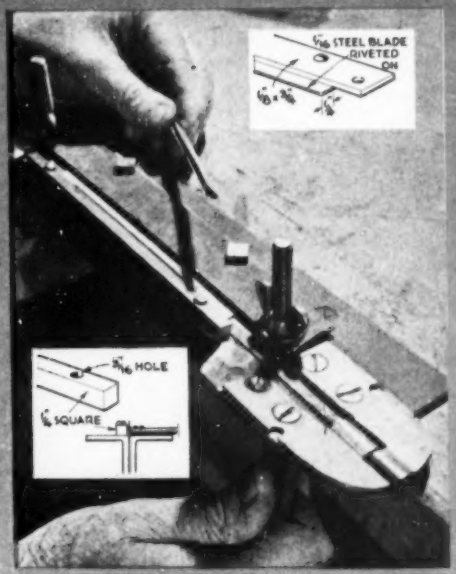
Make the bar clamp by filing a 45° edge on another piece of angle. Mark off ½", ¾", 1", 1½" and 2" sections. Clamp the piece inside a length of ½" angle and drill through both for bolts by which the box fingers will be mounted. Tap the holes in the fingers, opening out the others. Then cut the bar apart and assemble the pieces on the small angle. Drill through apex for hold-down bolts.

Spot these carefully in the bed bar so that the 45° clamp edge lies on but not in front of the hinge line. Drill and countersink two holes for mounting screws. Cut back the top flange of the front bar as shown and attach a handle to it—*J. M. Finn, Pittstown, N.J.*



IT'S IN PIECES. The bar clamp is cut into sections, or box fingers, bolted to a length of angle stock (above left). To make a bend between two others, as in forming a shallow box or tray (above right), use only enough fingers to make up the length of the bend. Springs on hold-down bolts raise the bar clamp automatically for insertion of work.





FULL BENDS of 180° like this are first folded up to 90° with the regular bar clamp. This is then replaced with a flat bar having a hard knife-edge riveted on. A ¼"-square bar fastened to the folding bar finishes the fold-over as shown in the inset just above.

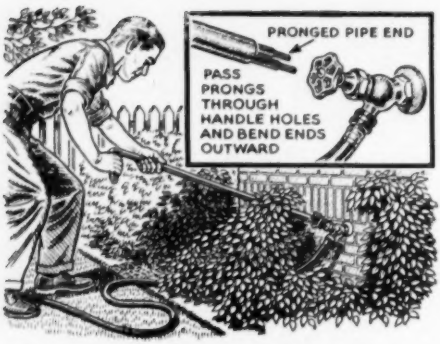
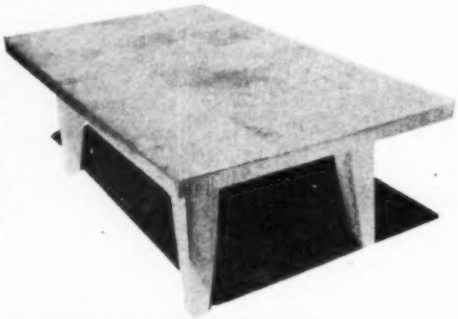


Table Top Is All End Grain

SEEKING unusual ideas for his woodworking projects, Paul Corey of Sonoma, Calif., came up with the coffee table below. The top is made of 2" slices cut from a 10"-by-10" redwood timber and laid out on a sheet of plywood to form a pattern of end grain.

After gluing the blocks, Corey feathered the bottom edge of the plywood so that it can't be seen from the side or above. Tapered legs, cut from redwood four-by-fours, were fastened with dowels and glue.



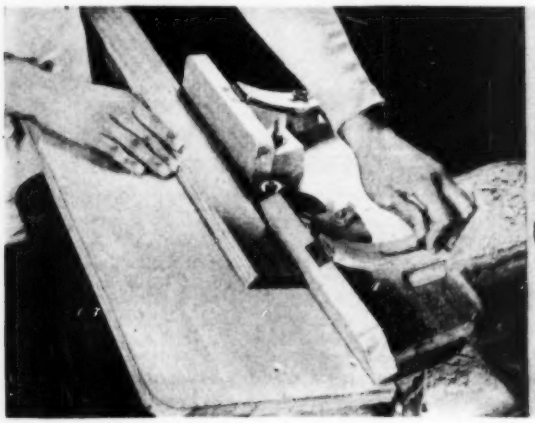
Crank Turns Hose On and Off

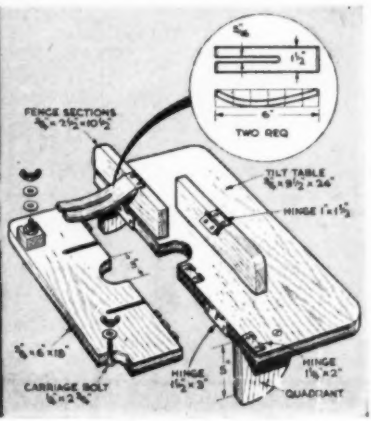
HERE'S a handy extension handle that will save you from reaching back through shrubs or walking in muddy flower beds if you leave a hose attached to a sill cock. Slot one end of a scrap of pipe with a hacksaw. Then bend the other end over for a handle. Insert the fingers through the spokes of the faucet handle and bend them just enough so that they won't slip out, making a sort of universal joint.

Tilt-Table Shaper Jig Supports Work Before and After Cut

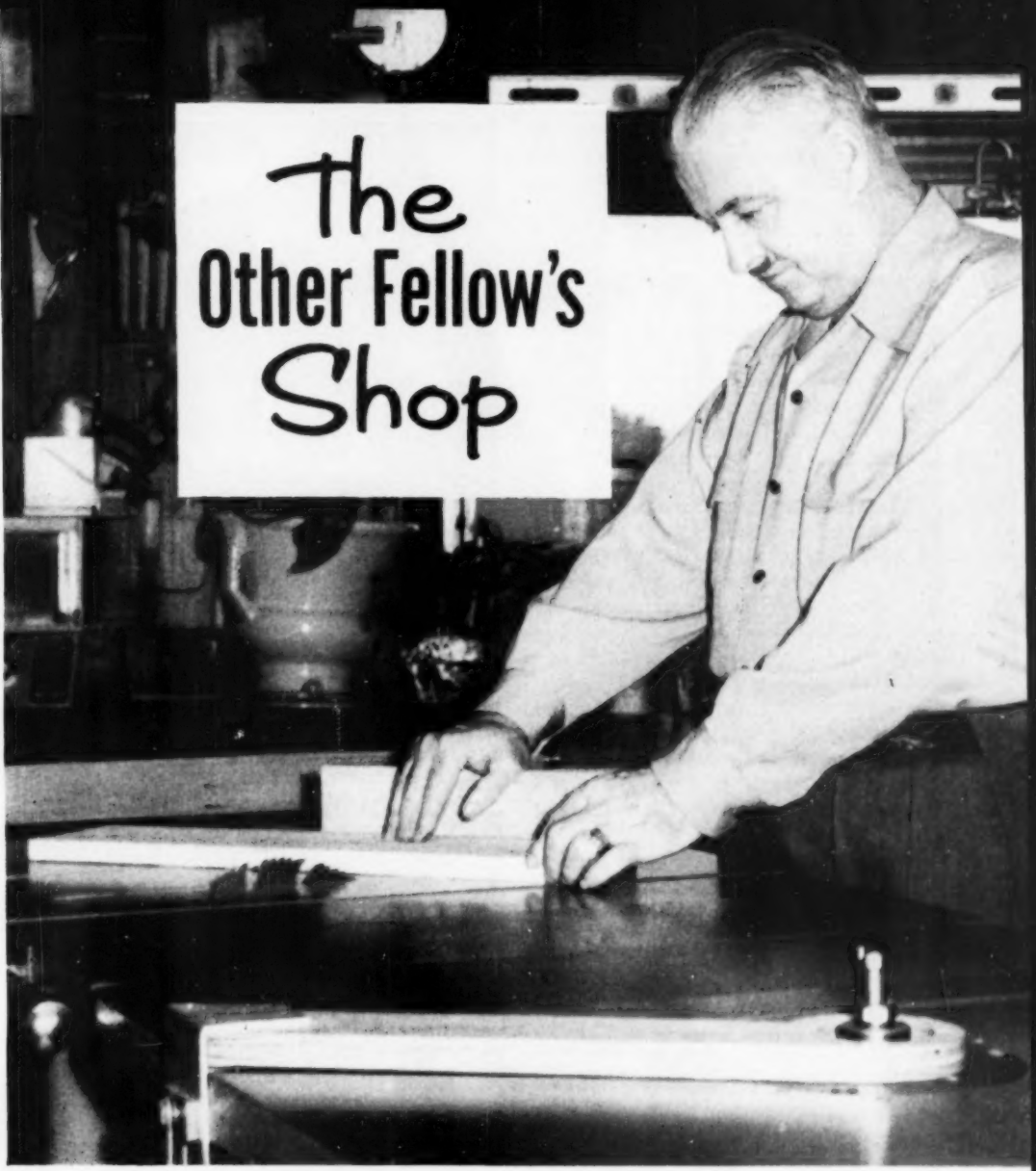
A TWO-SECTION hinged fence on this jig provides full support for work being beveled for building columns, or for shaping on a bevel. The lead fence supports the square edge of the board before it reaches the cutter and the back fence tilts to bear against the face of the bevel, instead of against the fragile sharp corner, as it leaves the cutter.

Join two pieces of ¾" plywood with hinges to make the tilting table and hinge the two fences to the adjustable part. Saw a 5/16" slot in each of two pieces of hardwood and cut the shape of the tilt-lock segments out of them. Hinge one of these to each fence and lock them with ¼" bolts and wing nuts. Attach the jig to the shaper table with the fence studs, or clamp it in place. Fasten a quadrant to each side of the movable table so that they straddle the shaper table. Lock the tilt table to the desired angle with C clamps hooked behind the edge of the shaper table, then adjust the fences to the work.—*Edwin M. Love, Palmdale, Calif.*





The Other Fellow's Shop



Here's Chet Moore's workshop heaven, where the walls are lined with power tools and the landlord never complains.

By Kenneth Wylie

IT'S a long way from Africa to Astor Street in Chicago, but Chester G. Moore, international businessman, has a hobby in both places.

In the Congo—and nearly every other wild and rugged area of Africa, Asia, Europe and North America—it's big-game hunting. In Chicago, it's precise machining, cabinetmaking and gun-rebuilding.

Moore's workroom is in a most unusual setting. The shop itself is a highly

professional place where he turns out projects ranging from custom-designed lathe attachments to rare-wood tool cases. But it isn't reached by loping down the basement stairs or trotting out back to the garage.

Shop in the sky. The Moore establishment, air-conditioned and neat as a slide rule, is 13 stories up. You get there by first accepting the greeting extended by the doorman who tends the front entrance; second, by riding an upbound elevator; and third, by receiving Mr. and Mrs. Moore's welcome to their luxurious apartment.

Moore and a partner put up the 15-floor apartment building and now share the two units on the topmost full floor. Choosing a quiet street in a swank section of Chicago, the partners built a de luxe structure designed for the carriage trade. In planning his workshop, Moore knew he'd have to have an ultra-silent room. The solution consisted of laying a 3½-inch sandwich of felt and concrete on his shop floor and installing acoustical tile on the ceiling.

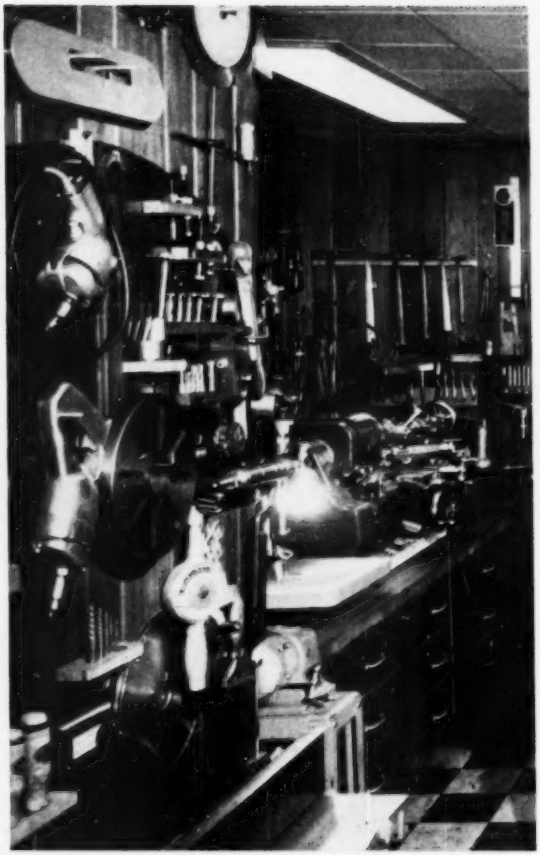
He says that the downstairs neighbors haven't banged on the pipes. The 3½-inch step up to the shop level is no trouble after the first few times.

Smithy start. Of the five shops Moore has had so far, this one, with its asphalt tile, redwood paneling and air conditioning, is by far the most elaborate. It's quite a contrast, he says, to his first shop, a blacksmith's setup on his grandfather's big Nevada-California ranch.

"It was crude, I suppose, but all I needed as a boy," Moore says. "I recall reworking some guns around the place and pounding out things on an anvil made out of a railroad rail."

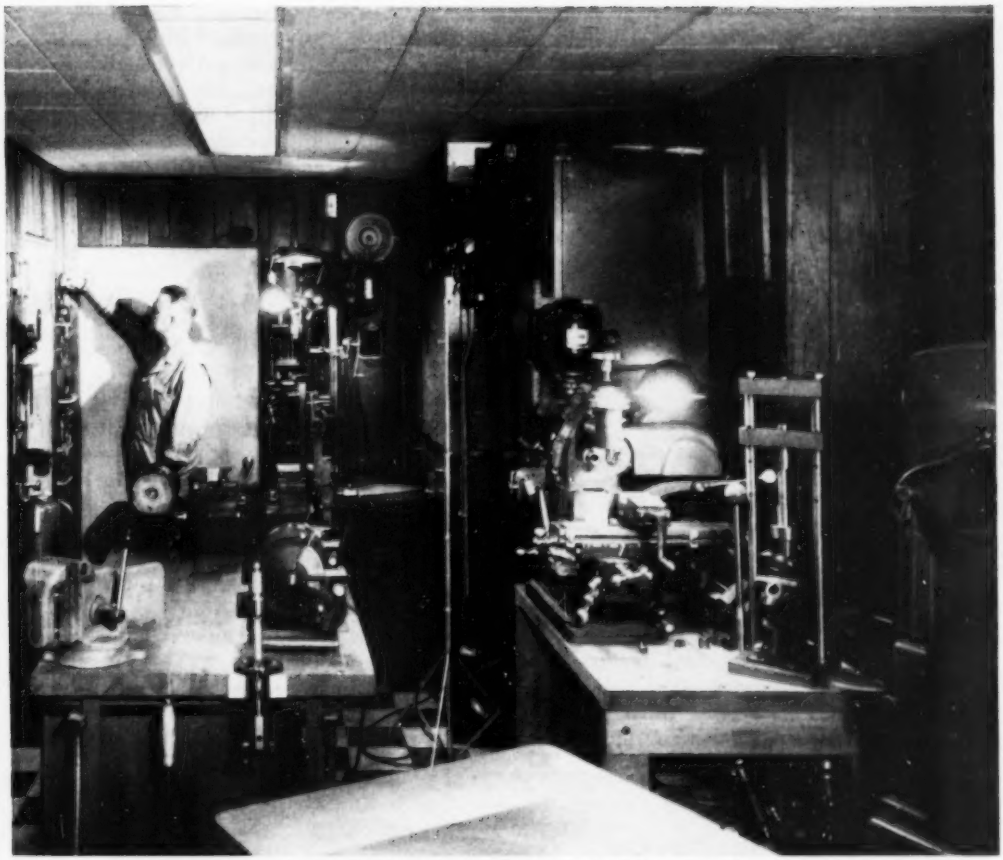
Currently he's still working on his guns, a collection of 100 or so pieces that decorate a good part of the walls in the trophy-laden den next door to his shop.

All equipment for gun work is somewhere in his shop, even to an electric furnace for heat-treating steel. Frequently he makes ballistics checks on the rifles and pistols, designs custom-made cartridges, and pours, with Mrs.



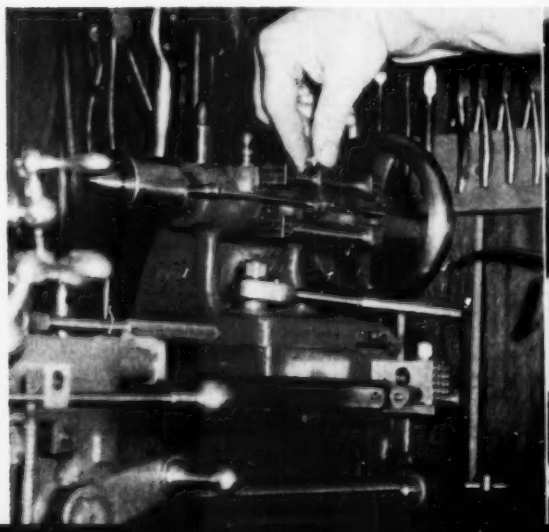
ELABORATE, TOOL-RICH SHOP, only part of which shows here, is tucked in one corner of

THAT STUMP Chet Moore used to support this homemade coffee table is an elephant's foot. On the table are other products of his: humidor from a rhino foot, lion-skull cigarette box.

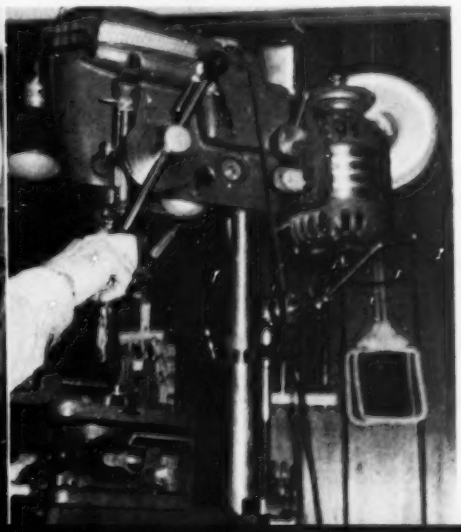


luxurious apartment owned by Chicago businessman Chester G. Moore. Vibrations from the 52 electric motors in shop are damped by special felt insulation. Note shadow-free lighting.

EXACT TRAVEL of tailstock ram is shown by this lathe accessory Moore built. It eliminates need for zero arithmetic, permits much more precise measurements than does the ram scale.



NO HORSING UP a heavy drill-press table for Moore after he built this crank-operated elevating gear. He also installed that extra light bulb inside the upper press casting.



Moore's help, his own target bullets.

Tools to order. "When I need something to do a particular job, especially to save myself time and needless work, I make it," Moore says.

Recently when he was working with sheet metal he got tired of fumbling first for a center punch and then a hammer every time he wanted to mark the stock. So he took time out to design and make a punch with hammer attached. He fitted a heavy steel ring and grip around the punch. The ring slides up and down the shaft, banging the punch point as needed.

Another metal job involved tiresome hacksawing. The natural step was to convert his bandsaw for metal cutting. "This thing is so convenient now," Moore says, "that it's far easier than sawing wood."

He built a jackshaft that drops the blade speed down to 160 feet a minute and rigged up an automatic-feed mechanism activated by an airplane shock cord.

One of Chet Moore's more complicated lathe accessories grew out of his need for a tool that would cut perfect balls for making mold cutters. His solution was a device with a caliper-like cutting tool. Mounted on the lathe bed, it will cut a true arc after a single adjustment.

Moore casually refers to most of his tool attachments as "Rube Goldberg affairs." But each one does a specific job and does it well.

Most shop owners would appreciate his lathe device for cutting bushings. It automatically turns walls to the same thickness on both sides without the slightest degree of taper.

And another convenience any lathe operator would warm to is his tailstock attachment for offsetting centers in taper turning. The tailstock is never moved; it remains in its on-line adjustment. Only the accessory is set off center.

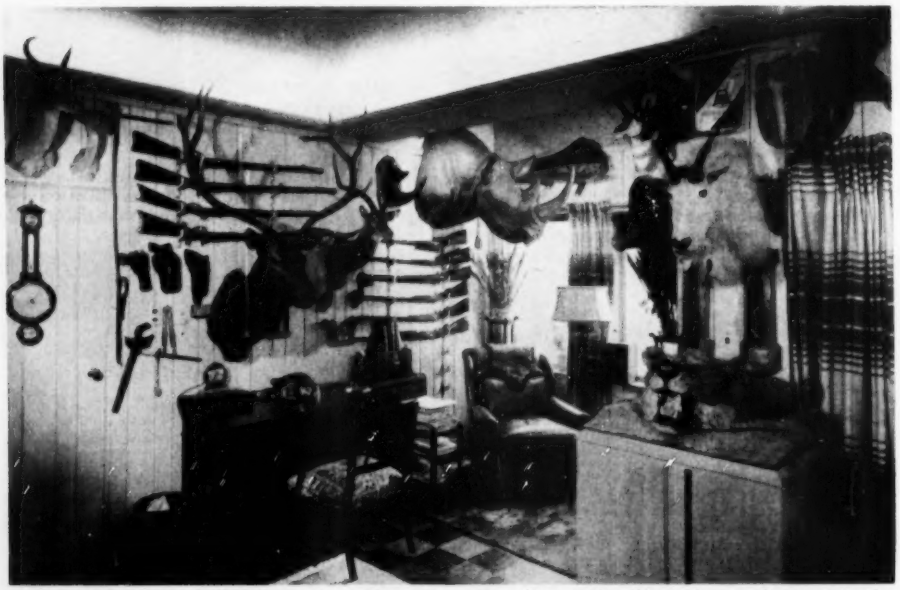
Also for ease in the tailstock department is an automatic depth recorder for

[*Continued on page 272*]

HINT TO AN UNHANDY HANDY MAN

A joint to be glued
Must be accurately trued,
Or you'll make a bobble
That's sure to wobble!

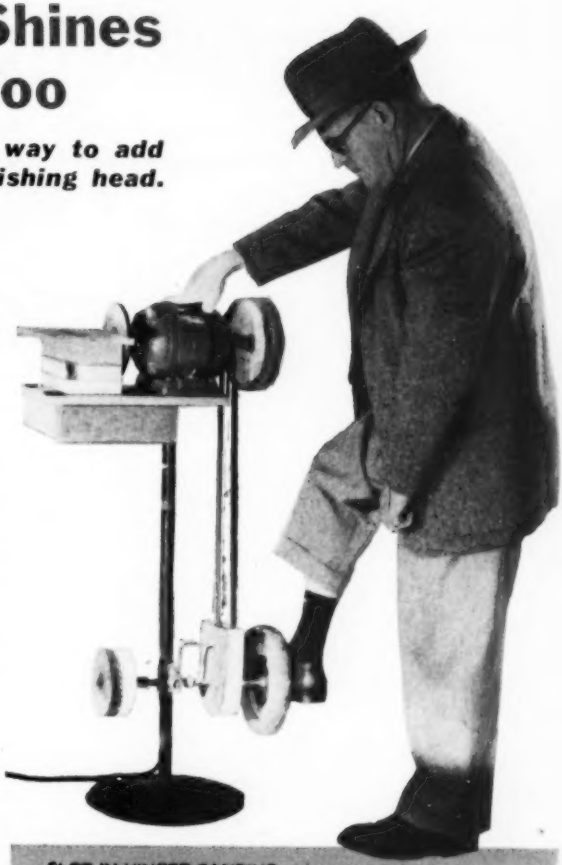
—Hugh Lineback



TROPHY ROOM near shop has gun racks and furniture Moore has made himself. Among the animals are one cat as yet unidentified by naturalists and a lion of record size. Besides enthusiasms for guns, hunting and shopwork, Moore is also a sports-car and photography fan.

Sander Shines Shoes, Too

Here is a simple way to add a brush and a polishing head.

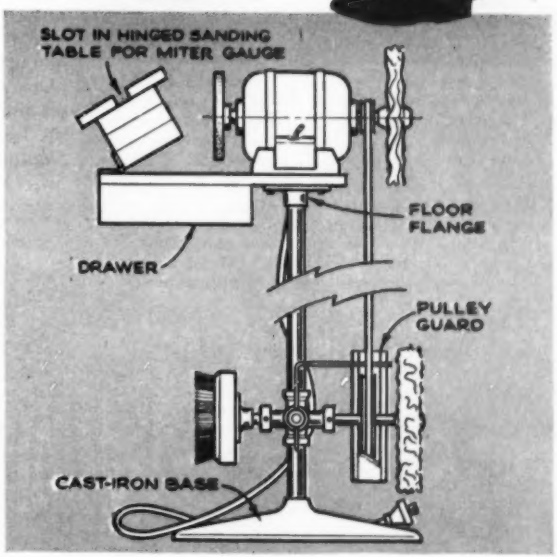


YOU can build a triple-duty sander-buffer-shoe-shiner with little work and less expense. The only "must" is a column-type base – one which provides full clearance for footwork around the brush and sheepskin polishing head.

I used an old vending-machine stand with a broad, cast-iron base and 1¼" vertical pipe. A foot above the base I inserted a T fitting with a short pipe projecting from its cross coupling. I drilled holes through the side walls of this pipe and press-fitted a bushing made from ½" pipe into the holes. A short shaft passes through the bushing and is kept from creeping by two collars. The shaft extension on one side is threaded for a floor-waxer-type brush. The other end carries a 5" pulley and a sheepskin polishing head. To prevent the pulley from rubbing against pants cuffs, a plywood guard is slipped over the shaft and around it.

From the shoe-shiner pulley, a belt runs up to a 1¾" pulley driven by a double-shafted motor mounted on a plywood table above the pipe column. The table is attached to the pipe with a floor flange and carries not only the motor but a hinged sanding bench fitted with a groove for a miter gauge. The hinging allows sanding disks attached to a drum on one end of the motor shaft to be replaced when necessary.

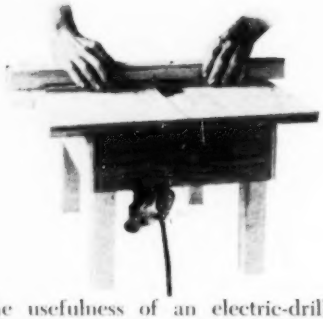
On the other shaft end is a buffing wheel and, just below the sander, a drawer for keeping abrasives and shoe-polish cans.–*W. G. Waggoner, Sacramento, Calif.*



Drill Saw Builds Its Own Table

If you have an electric drill, and a saw attachment for it, here is a shop project that will really put them to work.

CUT TABLE PARTS TO SIZE, using the electric-drill saw attachment to build its own table. All parts, except the plywood table top (see drawing below right), are small enough to come from a woodworker's scrap bin.

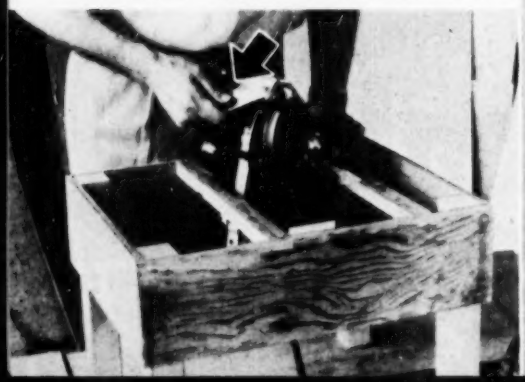


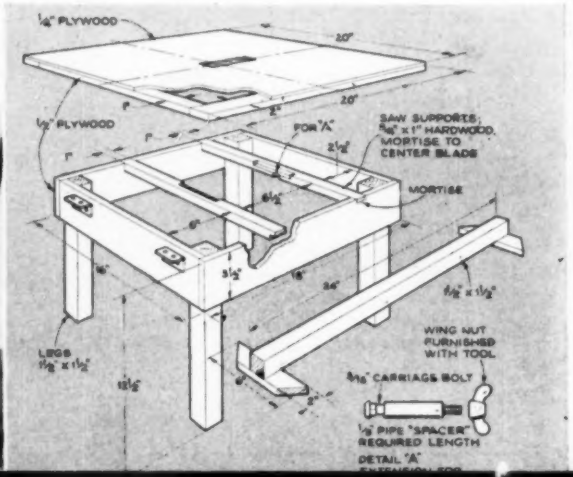
The usefulness of an electric-drill saw attachment can be doubled by mounting it inverted in a sturdy table. It will remain steady while you make fussy cuts or trim small parts that couldn't be handled by the saw in its portable form.

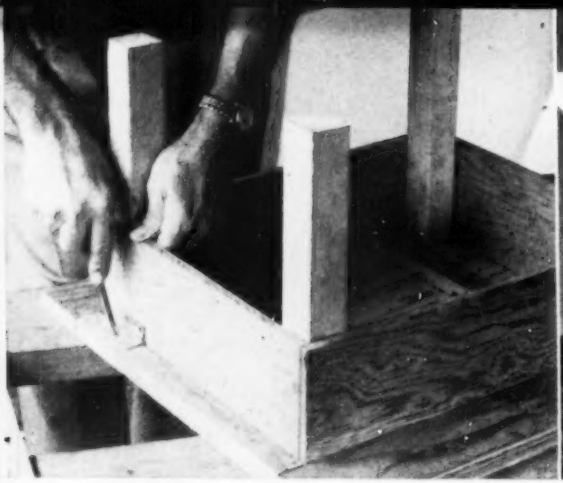
The table shown was built with short legs for use on a workbench. Long legs can be used instead, making it a floor stand. Box the legs in with a frame of ¾" plywood braced by two strips of hardwood that also support the saw. Make the top from a panel of ¾" plywood reinforced by a frame of ½" stock. Hinge the top to the frame so the saw can be easily removed.

The blade is tilted or adjusted for depth of cut by setting the controls on the sole plate of the attachment. An arrangement resembling a two-headed T square serves as rip fence and cutoff guide.—*Keith Vining, Daytona Beach, Fla.*

STRADDLE SIDES with two hardwood strips to support saw. Space and mortise them to fit sole plate of your saw. Note long bolt (arrow) and spacer sleeve that extend wing nut beyond supports for easy adjustment.





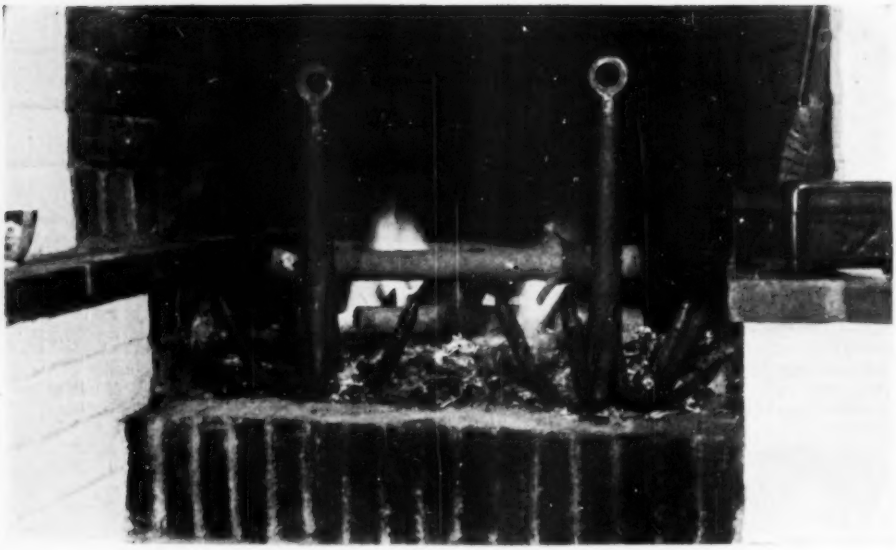


ATTACH TOP TO FRAME with hinges so that the free end can be raised to drop the saw in position quickly or remove it for portable use.

LOWER TOP slowly on the spinning blade to cut slot. Enlarge the slot with a chisel to provide clearance when the blade is tilted.

CEMENT STRIPS OF INNER TUBE to underside of table top, to press saw attachment firmly in place while in use and eliminate vibration. An eyehook locks the table tight on sole of saw to keep the tool from shifting.

GLUE TWO HEADS TO FENCE while holding it at 90° to blade. Used in this position, it guides work for cutting off. Clamped parallel to blade, it serves as a rip fence. The table must be square so fence will fit both ways.



Seagoing Andirons Drop Anchor On the Hearth

"WE NEED andirons," my wife announced. "But all I've seen are too expensive, and I haven't liked any of them."

The fall evenings were so chilly we could hardly wait to use our brand-new fireplace. "I'll pick up a pair in a secondhand store tomorrow," I promised.

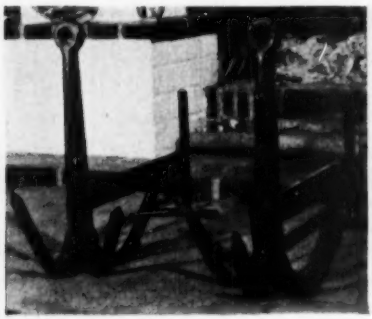
"Get iron ones. They're cheaper, and I don't want to polish brass. But I want something more interesting than just a ball on top. And don't pay over eight dollars," finished my commanding officer.

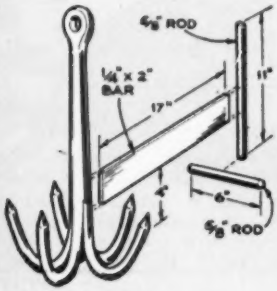
It was a tough assignment. All the andirons I found cost more than that, and none could be billed as "interesting."

Then, in a scrap yard, I saw a lot of grapnels, used to fish objects out of the water.

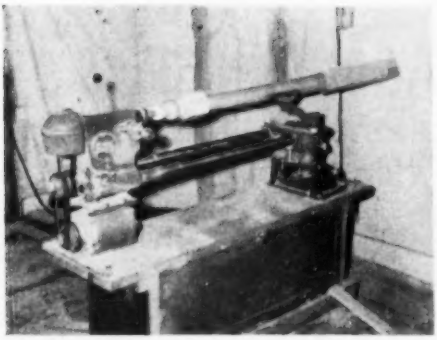
On an impulse I bought two for five bucks. For 75 cents more I got some scrap iron—2" bar and ⅝" rod. I hacksawed this into the pieces shown in the drawing and took them to a garage that did welding. The six welds cost me $2.50. A bottle of stove polish gave our new andirons an even dull-black finish.

My wife likes them even though I did go two-bits over the budget. Mission accomplished.—*Charles M. Keyes, San Francisco.*





BAR AND ROD stock, cut to sizes specified, and six welded joints transform grapnels into a pair of andirons. Legs extend upward at rear to keep logs from rolling off. Feet made of same rod prevent tipping. Grapnels shown are 20-pounders, 18" high.



Wall Supports Long Turning

MAKING a stair-rail post from a 5'-long four-by-four on my combination lathe required a special setup. First I aligned the machine with a wall stud and pulled a cord from the live center through the tailstock bore to mark the centerline on the stud.

Next I bored a ⅝" hole in the stud and drove in the tapered shank of the dead center. The lathe was secured with blocks and braces nailed to the shop floor. To seat the centers deeply, the work was counterbored at both ends. Roughing cuts were kept light. The bottom was left square, but to turn it I could have reversed the work. *—A. Roger Grout, Meadville, Pa.*

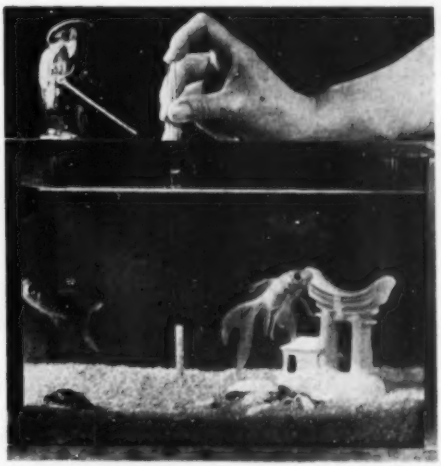
Tape Mark Shows Paint Left

IF YOU have several partly used cans of paint on the shelf, here's a way you can keep track of the amount in each—so you'll know at a glance whether enough remains for a particular job.

Press a strip of tape on the can. When you finish a job, measure the paint with a wire and mark the date and level with a pencil.*—Frank Shore, NYC.*

Saving Worn Phillips Screws

WORN heads on Phillips screws no longer keep me tracking down replacements—often a slow job when I want a screw of one of the many sizes and finishes used in autobody work. Now I simply cut a new slot completely across the head of the damaged screw with a hacksaw, and thread the screw back in place with an ordinary screwdriver. *—John Krill, N. Lima, Ohio.*



Glass Tube Tidies Up Aquarium

TO REMOVE matter from an aquarium without disturbing the fish, press your forefinger over the top of a glass tube and dip the open end in the water near the object. Lift your finger and water will rush into the tube, carrying the object with it. Close the top of the tube with your finger and lift it out to drain into a jar.*—John O. Bock, Yakima, Wash.*

The Wheelbarrow-of-All-Trades That Jack Built

EVEN the common wheelbarrow has been influenced by the modern trend toward multipurpose gadgets. Take a look at the barrow named Admire, built by John (Jack) Lorr, a Saratoga, Calif., art teacher. His homemade contraption is so useful that just using it could easily take all your spare time.

Seeing it for the first time, one neighbor was heard to mutter, "Dig that crazy unicycle." Another, more hep to the do-it-yourself routine, exclaimed, "Man, that's the multiest," and dashed home to create one just like it with his combination workshop tool. The photos show Lorr enjoying the whole thing—and his joke.

READY FOR ANY HOME JOB, the versatile barrow is fitted out as a portable workshop with basic tools needed for woodworking, gardening or just cleaning up the yard. As he sets out with both hands full on his day off, Lorr proudly surveys his brain child, as if to say—why didn't I think of this a long time ago?

Cultivator with Wheel as Bumper Rides Around Base of Tree

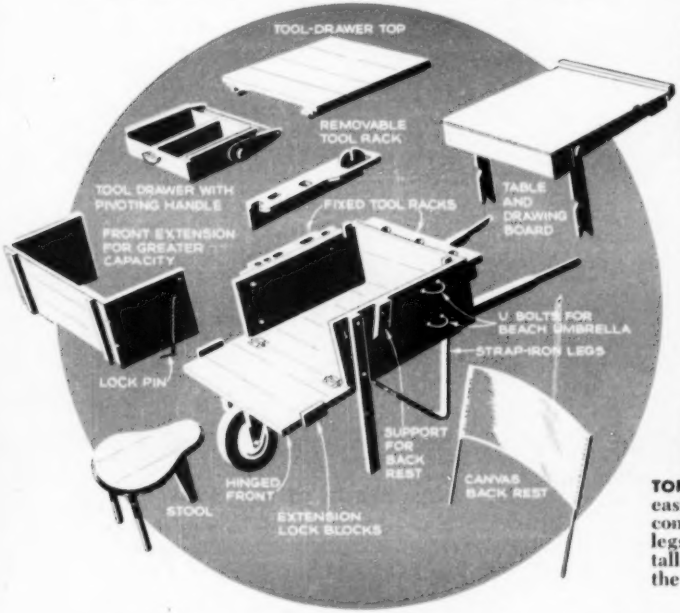
THIS orchard cultivator developed by O. H. Sheldon and Joe Amaral of Hughson, Calif., cultivates and cuts weeds around the bases of fruit trees without injuring them.

A barrow wheel is mounted on a vertical axle over a cultivator blade at the end of a tractor-drawn tool bar. The blade is lowered to the ground in front of the tree and as the wheel touches the trunk, it rolls around it, pulling the cultivator along with it.

A-A-AH. By carefully keeping all dirt out of the barrow, one can relax in its spacious interior. Entire outfit cost $5 to build, but seat cushion is optional at extra cost.

EXILED FROM THE HOUSE after being caught sleeping on the job, Lorr enjoys lunch behind the garage. Beach umbrella supported by the barrow shields him from California sun.

TIME FOR PLAY, and drawing-board attachment is set up, possibly to design a trailer to make the barrow really functional. Stool wedges into barrow's underframe over wheel.



TOPMOST BRANCHES of short tree are easily reached by standing on barrow converted into step stool. Two front legs make it tipproof. As tree grows taller, it will be just as easy to prune the lower branches.

Radius Rope Helps Spade Circle

To EDGE a perfect circle around a tree in a lawn, loop a rope around the tree trunk and around the neck of the shovel like this. Keep the rope tight with the shovel as you dig and it will serve as a guide for the circle and center the tree.

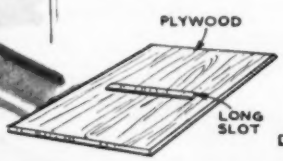
Angles Support Storage Jars

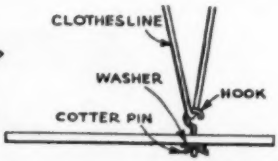
IN MY shop I have made hangers for my small-parts storage jars from corner angles. I bolted an angle near the edge of each jar lid so the jars could be hung in plain view on nails driven part way into the wall.—*John S. Kurnas, Birmingham, Ala.*

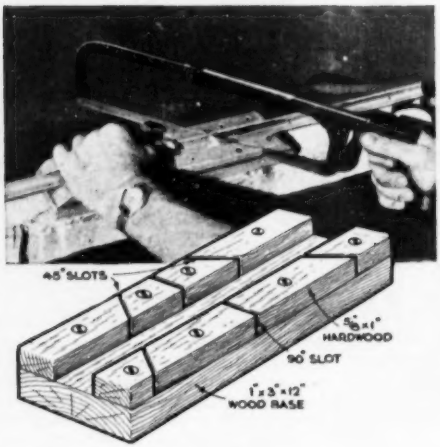
Clothesline Holds Carving

FOOT pressure pulls a clothesline tight around a piece of wood being carved, leaving both hands free for working. By easing up slightly, the piece can be shifted to the most comfortable position for all cuts.

Cut a slot in a plywood workboard for the clothesline to pass through and rest the plywood on a partially opened extension table or on a bench with an openwork top. Loop the clothesline in a screw hook set in a board that serves as a foot pedal. This arrangement will hold workpieces of any shape.—*Arthur P. Morgan, Naugatuck, Conn.*



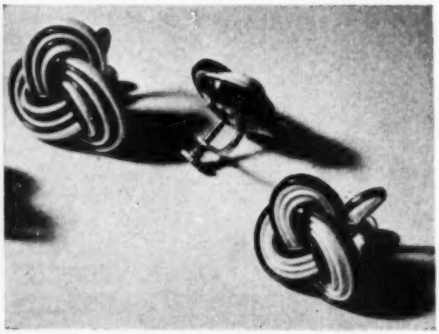




Miter Box for Moldings

A CARPENTER'S miter box is too deep for cutting ornamental chrome, aluminum or plastic moldings that dress up drainboards, bathroom walls and fixtures, or make attractive picture frames. The shallow box shown makes cutting moldings easy and accurate.

Make the molding box by screwing two ⅝"-by-1" hardwood strips 1" apart on a 1"-by-3"-by-12" block. Use a combination square to guide the saw when cutting the hacksaw guide slots. Make a left- and right-hand 45° slot and a 90° slot across the center for cutting left- and right-hand miters as well as square ends.—*Clinton R. Hull, Costa Mesa, Calif.*



Earrings Made of Vinyl Lacing

You can cement relations with the females who live over your workshop by turning out a batch of these bright-colored earrings to grace their shell-pink ears.

For each earring, cut six strands of vinyl lacing (three each of two colors) and lay them side by side with the colors staggered. Join the strands at one end by fusing them together with a hot soldering iron. Keeping them flat, work them into an overlapping triple loop and run the iron across the back to fuse the free ends. Cement the vinyl to an ear screw and set aside to dry. —*N. L. Friedman, Bronx, N.Y.*

▶▶▶Small parts such as washers and cotter pins can be carried conveniently in a tool box by stringing them out on a long bolt. This way they'll stay together and the right one can be selected at a glance.

You Can Make a

Spray-Gun Compressor

From Junk Refrigerator Parts

By Roland Loewen

LET'S face it, a commercial compressor for spraying paint costs money. But you can build your own, using a discarded refrigerator compressor. Chances are an appliance dealer will let you take your pick of his junked units for a couple of dollars, if you can step up to the right box, eye it knowingly and say: "Okay, I brought along my own wrenches."

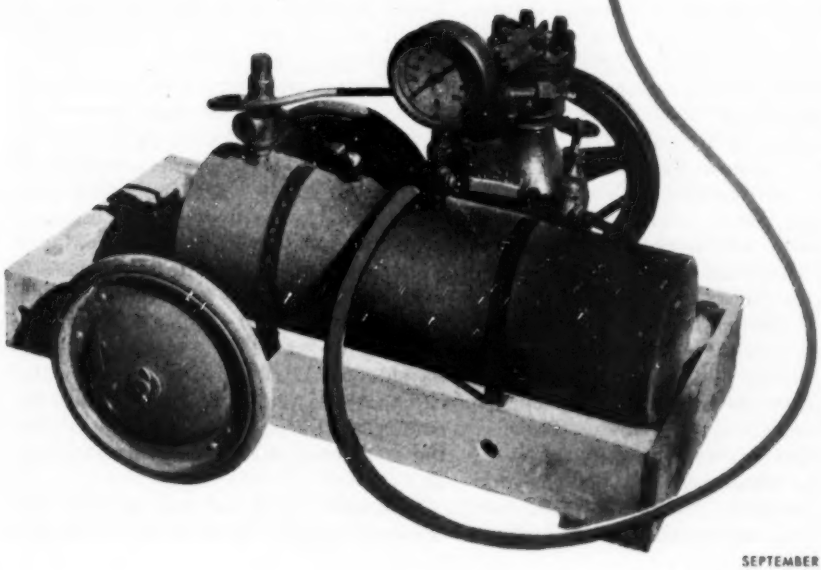
This may take a bit of briefing.

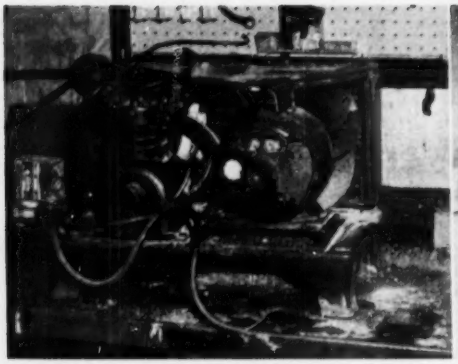
You should know, for instance, that refrigerators which run on gas or some other fuel are out—they don't use compressors. Also, steer clear of the newer mechanical models which house the motor and compressor in the same casting. Those equipped with rotary compressors will probably be too hard to modify, and the piston type can throw you if its close-coupled motor happens to be burned out or badly worn.

What you'll want is one of the older units with a compressor that looks like a one- or two-lung gasoline engine, belt-driven from an independent motor.

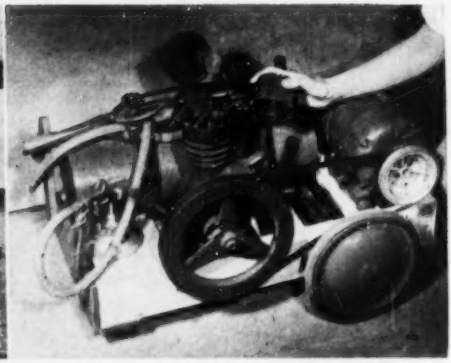
There will be two pipes attached to this compressor. One pipe admits gas from the refrigerator. The other carries this gas, under pressure, from the compressor to a radiator-like condenser. The

These tips on adapting old gas-circulating units will help you build a high-capacity, portable paint outfit for only pin money.





YOURS FOR A COUPLE OF DOLLARS—a discarded refrigerator unit, consisting of switch, compressor, motor, condenser, tubing and base.



PLACING AN OIL FILTER on the crankcase intake prevents damage to bearings. The elbowed pipe extension keeps the oil from sloshing out.

exhaust pipe is always coupled to a fitting on the compressor's cylinder head. But the intake pipe may be coupled either to the head, to the cylinder wall just below it, or to the side of the crankcase.

Your best bet is a compressor with an overhead or cylinder-side intake, but such models are hard to find and you may have to settle for one with a crankcase intake. For paint-gun work this latter type has the disadvantage of bringing incoming air in contact with crankcase oil before it is passed on to the compression cylinder through a valve in the piston head. However, the model shown in the illustrations uses this crankcase intake and has never caused trouble from oil carryover.

Disassembling and servicing the compressor. Once you've bought your compressor, remove the circulating unit from the refrigerator. Generally the compressor, motor, condenser and chemical reservoir are mounted on a single base. By loosening a few bolts you can free it from the chassis, but be careful when you disconnect or cut the intake and exhaust tubing. Some refrigerators circulate sulfur dioxide or possibly ammonia. These chemicals may be dangerous and are always unpleasant. Proceed with caution in a well-ventilated area.

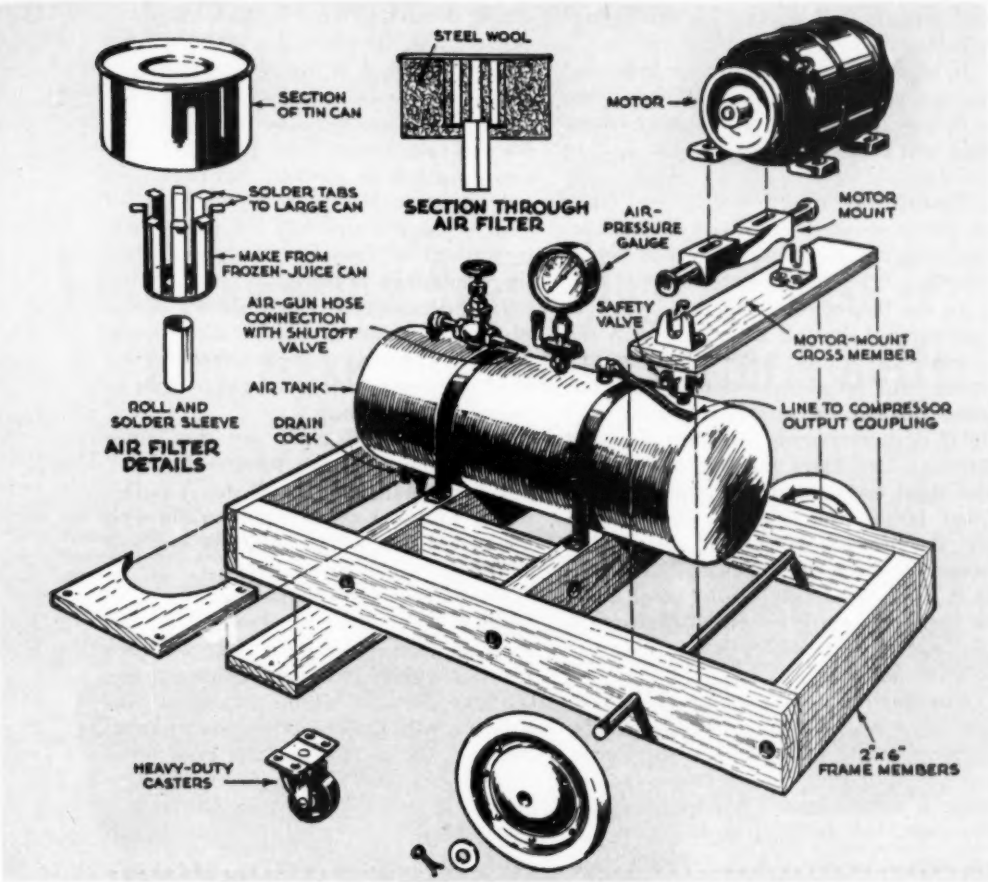
Take the whole assembly back to your shop. In addition to the compressor, you may be able to use the motor, belting and copper tubing. The condenser and refrigerant tank are, of course, worthless.

To check the condition of the compressor, drain the oil and either remove the inspection plate or, if the case is made in two sections, part the castings by removing the bolts which unite them.

The first thing to look for is the amount of play between the piston and the cylinder walls. To do this, unbolt the cap at the crankshaft end of the connecting rod and move the piston up and down, at the same time trying to rock it around. An extremely close fit isn't necessary. But if wear is very great it is best to know it at the start. In that case you might as well ditch the compressor and start shopping for another.

Assuming you have better luck—and the odds are 100-1 in your favor—look next for worn crankshaft bearings and check both the wrist-pin and crankshaft-end bearings on the connecting rod. Here, again, excessive wear is unusual. When it does show up, it's generally at the crankshaft end of the rod, where it can usually be taken up by removing a few shims placed between the rod and the bearing cap. If no shims have been provided, you will have to file down the cap faces on either side of the bearing concavity. Either way, make sure that the final result is a snug but free-turning fit.

One more check and you can close the crankcase again. Look at the oil dipper



CONSTRUCTION OF A CARRIAGE for your paint-spray unit depends on the dimensions of the compressor and tank. Built up of two-by-sixes, it rolls on two casters and a pair of coaster-wagon wheels. Intermediate cross members support the compressor, tank and hinged motor mount—also help to frame up a spray-gun receptacle. The tank and its five fittings are shown above the carriage. Detailed at the upper left are the three parts needed to assemble a home-made air filter. Soldered together and packed with steel wool, as illustrated, this filter is recommended for all compressors which draw in air through the side of the crankcase. Couple up a spray gun, set the safety valve at 35 lb. pressure, and you're in business.

on the bottom of the connecting-rod bearing. Most compressors run equally well with the crankshaft turning in either direction. But if the dipper is sharply angled, the crankshaft is meant to turn in the direction which lets it scoop up oil.

Pressure tank. Because your paint gun needs a smooth flow of air, a tank should be placed between it and the pulsing output of the compressor. In addition to leveling off the flow, this tank collects oil mist and condensed water in the air.

There are any number of war-surplus tanks suitable for paint-spray compressor units. Or, if you prefer, you can make your own tank from a 2′ length of 8-, 10- or 12″ pipe. Any welding shop will apply a couple of plates to the pipe ends.

Fittings. Whatever tank you use will have to be drilled and tapped for five fittings: a drain cock on the bottom, a compressor-pipe intake, a paint-gun hose connection, a pressure gauge and a safety valve on top. The sizes of the holes

and threads will depend on the fittings which you are able to round up.

If you aren't familiar with hole and tap sizes, take all of the fittings, along with the tank, to a plumber's shop, where they will make short work of the drilling and tapping jobs.

Testing the tank. War-surplus tanks are pressure-rated. But if you use a home-made tank, by all means test it before coupling it up to the compressor.

To do this, thread the drain cock in position and shut off its valve. Apply the air-pressure gauge and plug the air-intake and hose-connection holes. Pour water through the safety-valve hole until the tank is completely full, then plug that opening, too. Place the tank on a stove and light one or two burners under it. Long before the water is dangerously hot, the pressure gauge will register between 75 and 80 lb., or more than twice as much as the 35-lb. setting you'll want on the safety valve for painting. Shut off the heat and check for leaks along the welded seams.

Auxiliaries. Many compressors have a plug in the crankcase which can be removed to check the oil level. By threading a 4" pipe nipple into this hole, and using a dowel as a dip stick, you can eliminate the plug. Just be sure the crank doesn't strike the stick. You can prevent this by placing a wooden head stop on a dowel of just the right length.

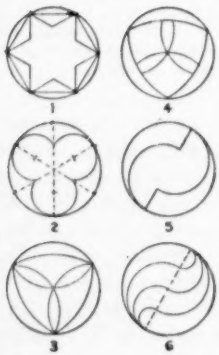
If you have a compressor with an overhead intake, no modifications are needed for the switchover from gas to air. On crankcase-intake models, however, you may have to thread a short length of bent or angled pipe into the intake hole to prevent oil from splashing out when the crankshaft is turning.

In the compressor unit shown in the photographs, an air-intake filter made from two tin cans and packed with steel wool insures a dirt-free supply of air to protect the bearings.

Motor. If you can't use the motor which came with the refrigerator unit, any ⅓-hp. shop motor will do. A pulley wheel which provides a 1-to-3 ratio with the compressor pulley will give you just about the right speed.

Base. For convenience, you'll want some sort of movable base. The one shown in the drawing on page 243 uses two heavy-duty casters and two coaster-wagon wheels. The frame is made of two-by-sixes, with the cross stringers supporting both the compressor and tank. Steel straps (pipe hangers) band the tank to its saddles and the compressor is held in place with lag screws. END

CIRCLE DESIGN



Planning a shop project may involve the development of a special design. An easy way to create designs is to start with a circle, then with a compass and ruler divide it and draw various curved and straight lines. In doing this, you will find a lot of use for the fact that the radius equals approximately 1/6 the circumference.

Six of the countless possible designs that can be developed in this way are shown. They might form the basis for a bit of wrought-iron work, a decorative medallion for use on a jewel box, the decoration on a knob and so on. Referring to the drawings: 1. Hexagon and six-pointed star created in a circle. 2. Suggestion of a clover leaf, made by drawing three inner circles whose radii are ⅓ the radius of the outer circle. 3. Three inscribed arcs having radii equal to radius of outer circle, plus three arcs each of which connects two points of intersection, with third such point as the center of curvature. 4. Shieldlike design produced by a variation of No. 3. 5. On a diameter, semicircular arcs are drawn to form a shape that might be the starter of a compressor or blower rotor. 6. By selecting various radii and drawing half-circles along the diameter of the outer circle, numerous designs of this sort result.

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

"Sports Car Racing or Everyday Driving . . .

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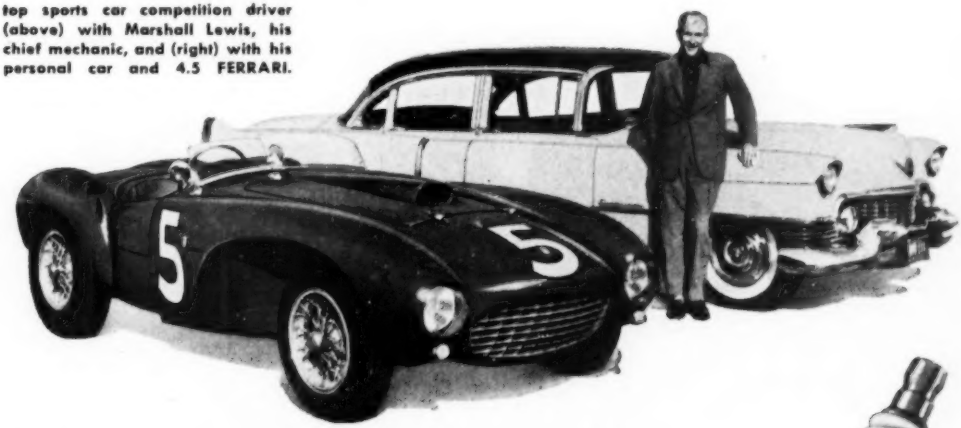
—says James H. Kimberly

top sports car competition driver (above) with Marshall Lewis, his chief mechanic, and (right) with his personal car and 4.5 FERRARI.



Here's Why Champion 5-Rib Insulators Give You Faster All-Weather Starting!

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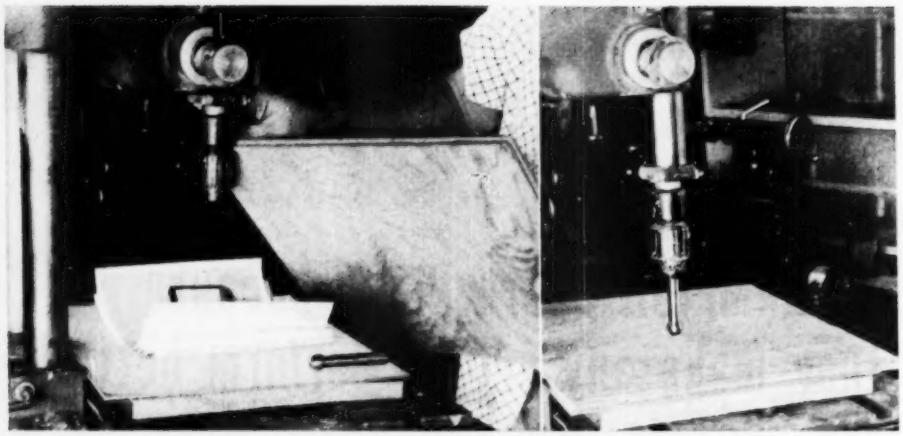
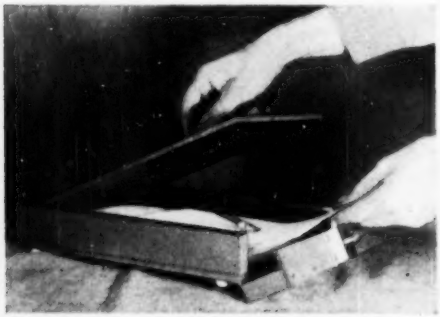


Drill Press and Plywood Take the Curl Out of Photographs

An amateur photographer who owns a drill press is overlooking one of the best possible means of taking the curl out of his prints. A large steel ball sweat-soldered to a short length of steel shafting held in the chuck provides even pressure. Two pieces of plywood furnish the top and bottom of the press. Sand the contact faces of the plywood thoroughly.—*W. G. Waggoner, Sacramento, Calif.*

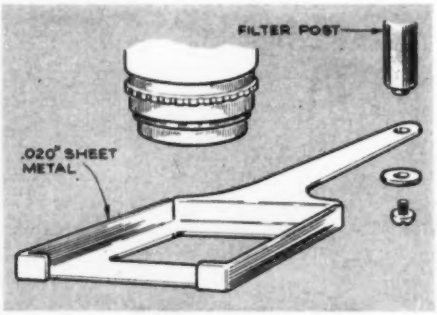


Box Kicks Out Photo Paper

In almost the click of a lens shutter, this dispenser pops a sheet of 8"-by-10" photo paper into your hand. When you raise the lid, a wire foot with a rubber tip sits up diagonally on the paper. As you lower the cover, the foot kicks out the paper. A positive catch locks the box and prevents fogging.

Scraps of ¾"-by-1¾" solid stock were used for the box frame. All other members are ¼" plywood. The top cover is hinged to the frame as is the front. A wire hanger bent into two screw eyes was used for the leg. It has a rubber eraser tip. For easy lifting, a knob was screwed to the cover.

Paint the dispenser a dull black to minimize internal reflections.—*Guy Slaughter, Crown Point, Ind.*



Holder Fits Varigam Filters

Darkroom workers who use Varigam paper will find this swing-away filter holder a handy accessory. It can be cut, bent and mounted in just a few minutes. Use .020" or .030" aluminum or other sheet metal. It can be mounted on the same post as the standard red focusing screen, with one swinging left and the other to the right. —*Harry L. Truchelut, Atlanta.*

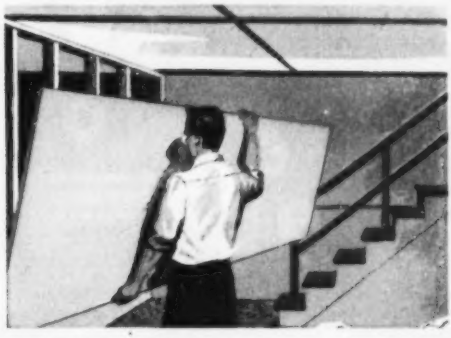
Here's a New Backdrop Wrinkle

If a sheet used as a photo backdrop has wrinkles and creases, the finished print will show them. To avoid this, shake the sheet slightly while the exposure is being made. The movement will blur out the wrinkles.—*Henry Josephs, Gardenville, Pa.*

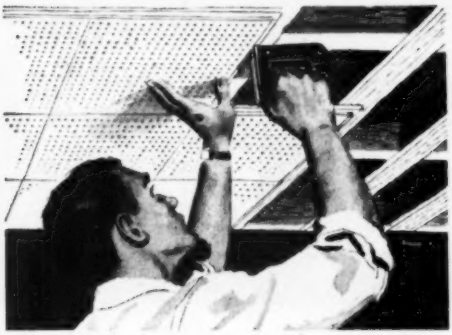
Four types of Temlok insulation board and how to use them

It's easy to add extra living space to your home with Armstrong's line of Temlok insulating fiberboards. For interior use, there's Perforated Temlok Tile, an economical, sound-absorbing ceiling material; Temlok Plank, a random-colored wall finish; and Temlok Board, in large, easy-to-handle sheets for ceilings, walls, and partitions. Temlok Sheathing, used on the outside walls, adds valuable strength and insulation.

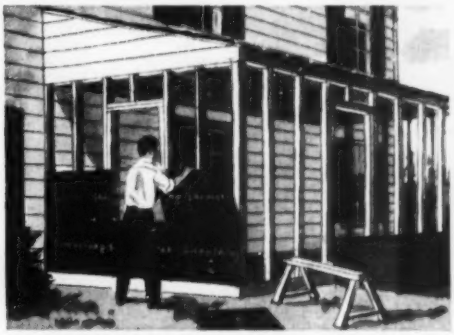
1. TEMLOK PLANK is a sturdy wood-fiber building material that can help you turn unused space into a cheerful room in just a few days. The special Lok-Bevel joint simplifies installation, assures a correct fit for each plank. Factory painted in a random-colored "Suntan Blend," Temlok Plank comes 8", 12", and 16" wide and 8' and 12' long.



2. TEMLOK BOARD comes in large sheets that cover walls, ceilings, and partitions quickly. These big boards mean fast installation because they can be facenailed in place over studs or wood furring strips. Temlok's insulating value keeps heat inside in winter, outside in summer. Prepainted in Light Ivory. Sizes: ½" and ⅜" thick, 4' wide and up to 12' long.



3. PERFORATED TEMLOK TILE is a noise-absorbing ceiling material that can add comfort and quiet to busy kitchens, playrooms, shops, and utility rooms. Installed over furring strips, Temlok Tile has a Lok-Bevel joint that hides nails and staples. Prepainted tiles, plain or perforated, are 12" x 12" or 16" x 16".

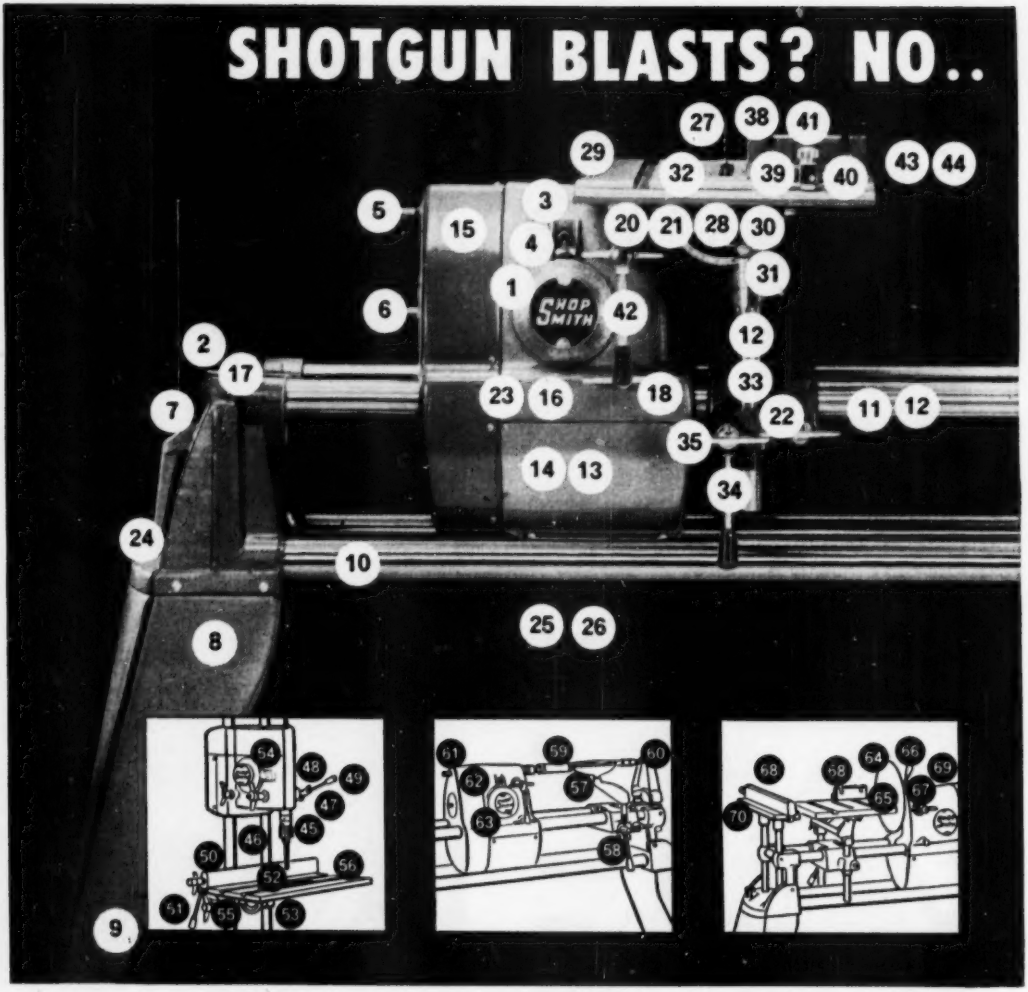


4. TEMLOK SHEATHING nailed to the framework of an enclosed porch or addition adds extra strength and insulation. This sturdy building material is impregnated with asphalt and has a water repellent "Rain Shield" finish to keep your home weathertight all year round. Sizes: 2' x 8', 4' x 8', 4' x 9'.

For full details on Armstrong's Temlok see your lumber or building materials dealer. For your free copy of the booklet, "New Ways to Remodel Your Home," write Armstrong Cork Company, 3709 Washington Avenue, Lancaster, Pennsylvania.

ARMSTRONG'S TEMLOK

M-67® Monowall® Cushiontone® Insulating Wool Hardboards Counter-top Cement



New SHOPSMITH as a Circular Saw

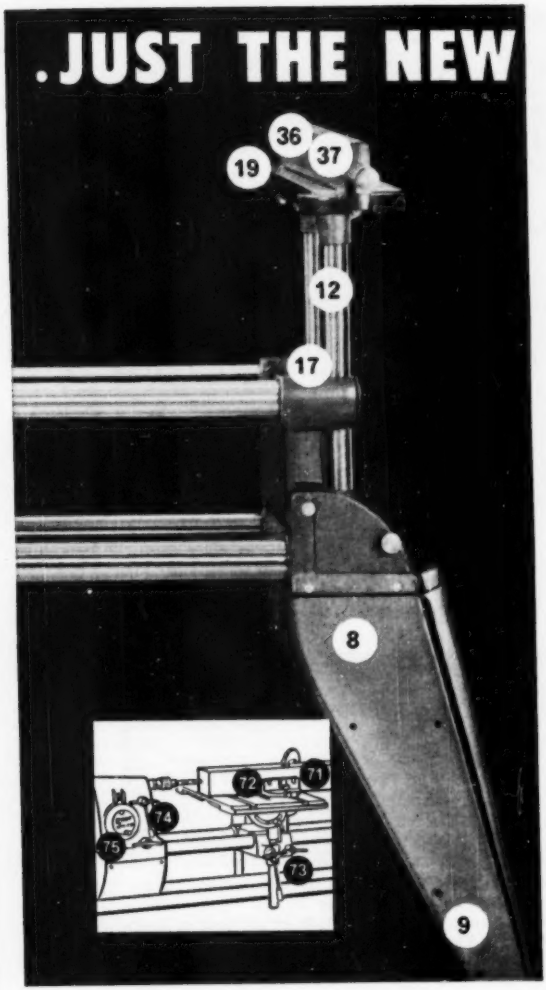
27. 9" All-purpose Saw Blade. 28. Quick-change Arbor – 1¼" shank, centers blade over spindle. **29. 14" x 18⅜" Table** – with precision surface, integral fence bar. **30. Calibrated Trunnion** – guides table through tilt range, calibrated to 1° readings. **31. Auto-stops** – adjustable Nylok set screws provide auto-stops at 0° and 45°. **32. Table Insert** – coined and "bowed" for flush fit, two projections protect saw blade from hitting sides of insert. **33. Table Tubes** – milled rack, chrome plated. **34. Table-height Lever** – for extra-fast, hair-line adjustments. **35. Table-height Lock. 36. Self-squaring Rip Fence** – one-knob control squares fence, locks it *both* on front and back of tables. **37. Depth-of-cut Scales** – engraved on rip fence to provide positive accuracy regardless of variations in saw blade diameters. **38. Depth of Cut** – up to 2½"; on 45° bevel, up to 2 3/8". **39. Calibrated Miter Gauge** – calibrated to 1° readings. Glides on nylon inserts. **40. Miter Gauge Stops** – at 45°, 90° and 45°. **41. Miter Gauge Lock** – lets you lock miter gauge bar in table slots for accurate jigging, rigid support. **42. Quill Micro-Feed** – allows quick, precise blade-to-fence adjustments. **43. Blade-to-fence Capacity** – up to 48". **44. Effective Table Area** – 18 3/8" x 56" with standard extension.

New SHOPSMITH as a Vertical Drill Press

45. Geared Jacobs Key Chuck – takes drills up to ½" shanks. **46. Large Capacity** – drills to center of 16½" circle. **47. 4¼" Quill Feed. 48. Depth Control Dial** – no stop nuts, you just set the dial and lock it. **49. Right or Left Hand Feed Lever** – lever detaches with a twist. **50. Ready-made Jigs** – with miter gauge and rip fence. **51. Forward-feed Table** – using table-raising lever, for light milling and fine adjustments. **52. Chuck-to-table Capacity** – 26" maximum. **53. Chuck-to-floor Capacity** – 58" maximum. **54. Speed-Dial** – gives you proper speed for all drilling, mortising, routing and shaping operations. **55. Carriage Locking Knob. 56. Large Tilting Table** – with rip fence to form V-block jig.

New SHOPSMITH as a Lathe

57. Universal Tool Rest – slides parallel to work, swings in full 360° arc. **58. Tool Rest Height Control** – accurately adjusted through rack-and-pinion control. **59. Large Capacity**



FEATURES OF SHOPSMITH* Mark 5

It has the same famous SHOPSMITH* principle of 1 motor, 1 spindle, 1 table and 1 bench, but beyond that you'll barely recognize the all-new SHOPSMITH Mark 5. In fact, you can hardly touch the new SHOPSMITH without putting your finger on an exciting new feature! In many cases they're downright revolutionary developments . . . like the Speed-Dial or the Power-Mount. But to do justice to the NEW SHOPSMITH . . . and to your own hidden talents . . . you've actually got to see it *in action!* On display at leading hardware and department stores or any Montgomery Ward store. Five tool unit delivered complete, ready to plug in, for **$269.50**

1. Speed-Dial—lets you select the correct speed for any job simply by turning a dial. Range: 700 to 5200 rpm. **2. Power-Mount**—for 10-second addition of auxiliary tools such as jigsaw or jointer. **3. Guarded ON-OFF Switch**—can't be knocked ON accidentally. **4. Speed-Dial Safety Catch**—automatically stops Speed-Dial at 3500 rpm . . . is spring-released for speeds above 3500 rpm. **5. Auxiliary Spindle No. 1**—lets you operate combination setups: jigsaw-sander, lathe-honing wheel, etc. **6. Auxiliary Spindle No. 2**—higher speed (1.7 to 1 ratio) for simultaneous saw-jointer operation. **7. Headrest Lock. 8. Bench Ends**—made of rugged steel and included in price. **9. Pre-drilled Holes**—for mounting retractable casters. **10. Bench Tubes**—integral, rigid, corrosion-treated. **11. Tubular Ways**—centerless ground, heavy-duty twin-tubes providing extreme rigidity, accuracy. **12. Rust-proofing**—tubes and columns are hard-chrome plated. **13. ¾-hp. Motor**—built-in, heavy-duty, ball-bearing capacitor-type. **14. Built-in Blower**—keeps motor temperature down. **15. Enclosed Belts and Pulleys**—an important safety feature. **16. Precision Cast Headstock**—made of aircraft quality aluminum alloy. **17. Hand Grip Locks**—one at each end for locking extension table, tailstock, accessories. **18. Headstock Lock. 19. Extension Table**—fully adjustable to match height of saw table, mounts on either end of unit. **20. Ball-bearing Spindle**—lubricated for life. Spindle runout is less than .001". **21. Spindle Tip**—it's induction-hardened, has exclusive tapered safety flat. **22. Carriage Lock**—double wedge action locks and unlocks on both tubes. **23. Baked-enamel Finish**—two-tone, hammered effect. **24. Built-in Holder**—for chuck key and the one Allen wrench that controls *all* adjustments. **25. Overall Dimensions**—41½" high, 71" long, 19" wide. **26. Fully Assembled**—SHOPSMITH comes to you all ready to plug in.

—16½" swing, 34" between centers. **60. Eccentric Cup Center Mount**—easily offset up to ½" for turning 1" tapers over length of workpiece. **61. Extra Spindle**—for mounting honing wheel to sharpen chisels between cuts. **62. Movable Headstock**—slides to end of ways for easier faceplate turning. **63. Variable Speed Selection.**

New SHOPSMITH as a Sander

64. 12" Sanding Disc—statically and dynamically balanced. **65. Undercut Table Edge**—for 45° angle sanding without chatter. **66. Quill Feed**—allows sanding disc to be fed into work. **67. Quill Feed Stop**—for accurate duplicate sanding. **68. Miter Gauge and Rip Fence**—provide handy jigs. **69. Extra Spindle**—for mounting drum sander or another sanding disc. **70. Fence Offset Screw**—quickly offsets fence for accurate edge sanding and jointing of plywood.

New SHOPSMITH as a Horizontal Drill

71. Unlimited Work Length Capacity. 72. Miter Gauge and Rip Fence—serve as accurate jigs. **73. Hairline Table Adjustment. 74. 4¼" Quill Feed**—with depth control dial. **75. Variable Speeds**—from 700 to 5200 rpm. using Speed-Dial.

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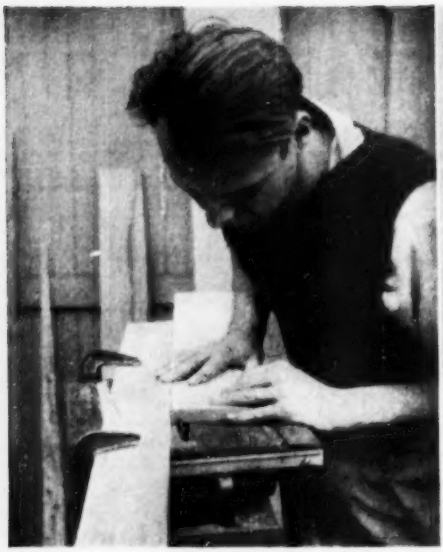
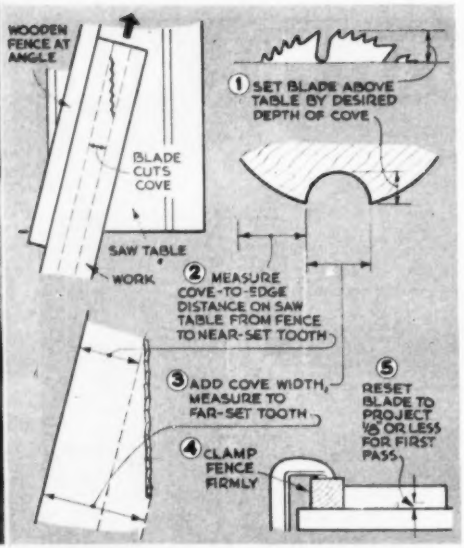




FENCE ANGLE determines width of cove. Setting can be checked with flat stock as at left. Distance from fence to centerline of blade should be equal to the radius of round work.

Plain Saw Blade Cuts Flutes in Round Work

COVE cutting, by which concave moldings are formed with a circular saw blade, will also flute round work. With care, even spiral flutes can be formed. A combination or a rip blade can be used. It must be sharp and have ample set.

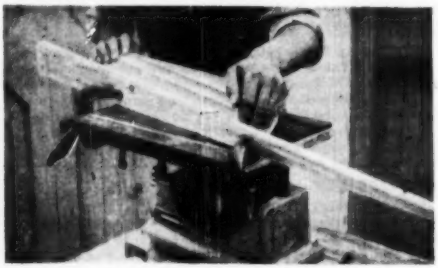
Follow the numbered drawings to set the wooden fence for the desired cut. Start with the blade ⅜" or less above the table, raising it slightly for each pass. Work hugs the fence if angled with the outfeed end nearer the blade, as in the drawing, rather than the reverse.

For round work, the fence must be long enough to support the piece the full length of the cut. Mark the desired flutes around the work. Drive a nail in at each end. Guide with the nails on top of the fence. Hand-sand flutes to smooth them.

For spiral flutes, make a fence that tapers in height, and round off its top edge. Drive one guide nail into the front end of the work, place it against the blade with this nail on top of the fence, and drive a second nail in at the rear end where it also will ride the fence.—*Guy H. Learned, Altadena, Calif.*

ROUND STOCK is guided by nails riding on top of fence. Leave this clear by screwing a clamp strip along bottom of fence or by boring holes in it for the clamps as shown here. Remove and reinsert nails for successive flutes. Nail holes can be filled or, if work is long enough before fluting, cut off.

FOR SPIRAL FLUTES, fence is higher at one end and top edge is rounded. Keeping the guide nails in contact with this edge causes work to turn slightly as it is advanced.



Revolutionary new heating system has individual control for each room

Room heating unit is recessed into wall, with only grille projecting. Can be painted to fit any color scheme. Above illustration shows 12,000 Btu unit.

Outstanding comfort and economy. Same steam supplies heat and operates turbine-driven room heater fans

Accurate control of temperature in *each individual room* has long been the goal of heating engineers. Now, with the Iron Fireman SelecTemp system, this is not only possible, but practical and economical. SelecTemp is a unique development in heating, now being enjoyed by thousands of people. Here are a few of the many SelecTemp advantages:

Thermostat in each room. Temperature of every room (including bathrooms) can be varied to fit the preferences of the occupants—and without affecting heat in other rooms. Desired warmth is maintained regardless of changes in outdoor temperature, wind direction or velocity, or of heat from sun or fireplace.

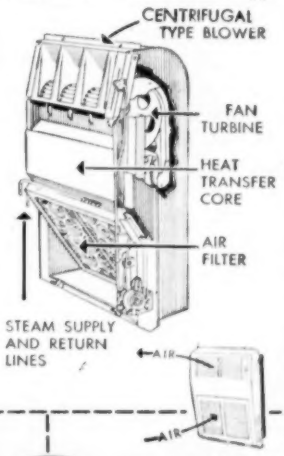
Continuous modulated heat. Each room unit automatically modulates its heat output, ranging from 100% down to 5% of capacity, maintaining a *continuous* flow of filtered warm air. Underheating and overheating, associated with "on-and-off" systems, are eliminated.

Low initial cost. No other system can be so easily and economically installed in new or existing homes or buildings. Costs no more than many systems with only one thermostat for entire house. Small flexible copper tubing (¼ inch nominal I.D.) carries steam to each room unit. Return lines are ⅛ inch I.D. tubing. Unlike "hard" piping, long lengths of copper tubing, easily bent by hand, are snaked into the walls and around obstructions as readily as electric wiring, with a minimum of cutting and fitting. No electric wiring required for thermostats or fans.

Economical operation. Accurate heat control prevents fuel-wasting overheating. *Unnecessary* heating is eliminated. Rooms temporarily unused can be kept cool, but warmed again very quickly, at any time. Each unit automatically regulates its heat output to compensate for warmth from the sun, fireplace or cooking range.

Locate boiler anywhere. Automatically fired oil, gas or coal boiler can be installed in the most convenient place, and yet will supply the required heat to every room.

Compact, efficient room heaters. Room heater units are only 18 inches high. Three sizes: 6,000; 12,000 and 18,000 maximum Btu output. Each unit contains thermostat, copper heat transfer core, spun glass air filter, and quiet aluminum circulating fan, powered by steam turbine. Turbine rotor and fans are mounted on the same stainless steel shaft, which turns on self-aligning Graphitar bearings, requiring no lubrication. Filtered air is continuously circulated, with both air volume and temperature automatically varied according to room needs.



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Gus Closes a Sticky Case

[Continued from page 194]

ing around 25 pounds of pressure to that window. The window would have to move up—unless it was tightly jammed. In that case a load might be thrown on the entire system that could cause the circuit breaker to throw open.

Gus tried to peer down into the window with his pencil light, but the opening was too narrow. There seemed to be no alternative but to tear the door down. He washed his hands carefully, broke out special tools and went at it. Shortly he had loosened the door panel enough so that it moved out a bit. Gus distinctly heard something fall inside the door. On a hunch he threw the toggle switch. Instantly the window moved up, so fast that it almost caught Gus's face.

Scratches Are the Tip-Off

With the window working smoothly, Gus was tempted to refasten the door panel and let it go at that. Whatever had been jammed inside had evidently fallen to the bottom of the door, where it would cause no trouble in the future. Wells would soon return, impatient as usual, demanding his car.

Thinking about it, Gus's glance fastened on several long scratches on the window glass. Whatever had been jammed inside, had evidently been awfully hard. A calculating gleam came into his eyes. He began tearing the door down.

"My car ready?" Fenton Wells demanded, coming into the garage an hour later, accompanied by Henry Olds, his handy man.

"Just about," Gus told him, shutting off the paint from his spray gun, and spraying the fender repair with air to dry the final coat of finish paint. "I put in new plugs. The windows—"

"Never mind the details, Wilson," Wells snapped. "Send me a bill. Get in, Olds. Get in, man. I'm in a hurry."

As Wells got in the car, Gus leaned against the open door.

"About Pete Sullivan," he inquired. "Going to prosecute?"

"Of course. The man's a maniac. I'll have him jailed."

"I agree," Gus said amiably, "that Pete shouldn't have done what he did. But sometimes we must consider extenuating circumstances."

"Extenuating circumstances, my eye," snapped Wells.

Gus extended his hand, in which lay an object that glittered with blue fire.

"Buying an expensive bauble like this for a birthday present for a six-year-old kid is news in this town," he said. "We all heard about it. We also heard about it when it disappeared from your granddaughter's hand. I found it jammed in a window of your car, where undoubtedly the kid had dropped it."

Wells snatched the badly bent ring from Gus's hand.

"My granddaughter's ring," he gasped. "It was quite expensive, you know. A small stone—but blue-white and perfect."

"Blue-white or black," Gus said softly, "you accused Marie Lisbeth of stealing it, and fired her—remember?"

Looking into Gus's eyes, Wells did remember—and quite suddenly. The color drained from his face. For a moment, he looked small and shriveled, and somehow pitiful.

"So I did, Wilson," he mumbled. "So I did."

Gus Makes a Suggestion

"Perhaps," Gus said slowly, "you owe Marie an apology. Maybe it would be a nice gesture on your part to overlook Sullivan's action."

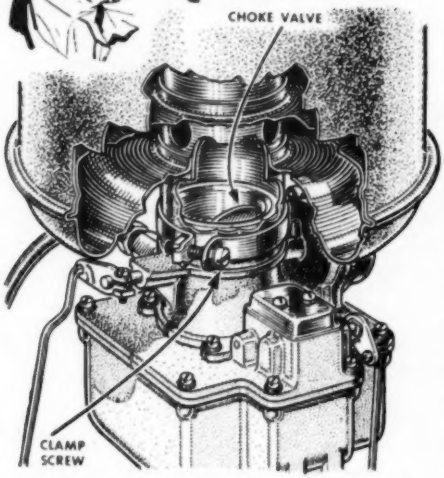
Wells was regaining his composure. "What has all this got to do with Pete Sullivan, may I ask?"

Gus set a match to his pipe before replying. "Did it ever occur to you," he asked, "that Pete Sullivan might be pretty fond of Marie Lisbeth?"

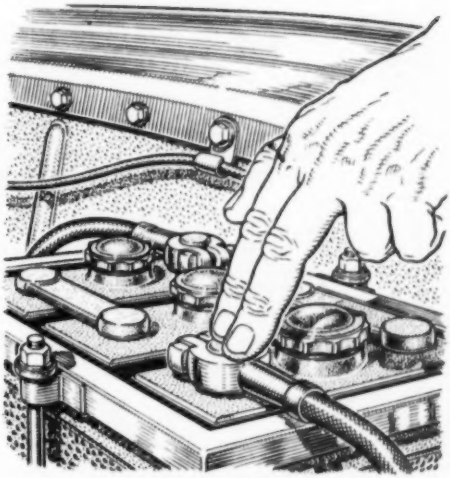
Wells took a deep breath. "I see what you mean, Wilson," he said, softening his tone. "I'm wondering if it wouldn't be better if I saw clearly more often." END

NEXT MONTH: Gus tricks a truck.

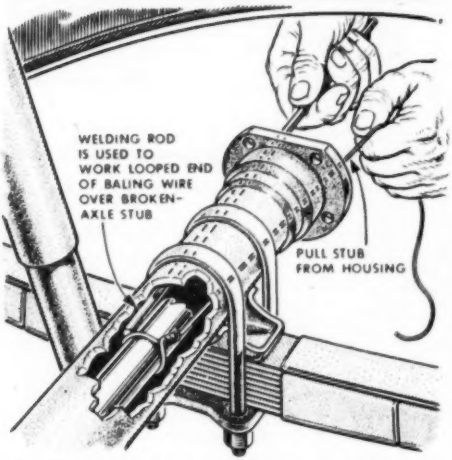
Hints FROM THE MODEL GARAGE



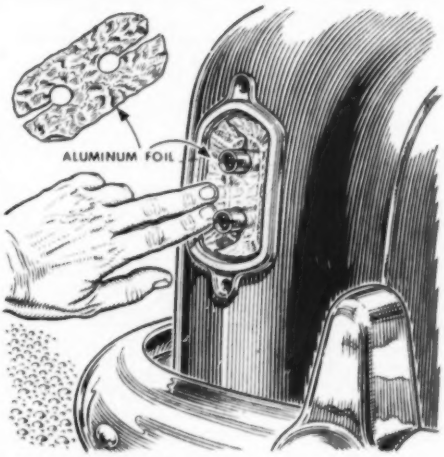
A stuck choke valve is often the result of overtightening the clamp screw on the neck of the air cleaner. This tends to distort the barrel of the carburetor slightly, causing the butterfly to stick. Loosening the clamp screw remedies the condition.



A loose battery connection can be spotted by turning the engine over for 20 to 30 seconds with the ignition off. A dirty or loose connection will feel warm to the touch, indicating that resistance is robbing you of starting power.



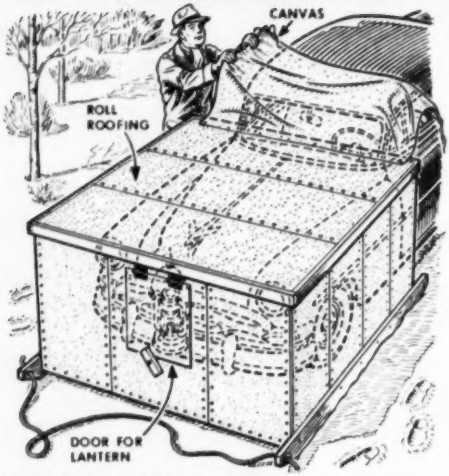
Lasso the stub of a broken axle shaft with a loop formed on one end of a piece of baling wire. Shape the loop around the removed piece of axle and work it onto the stub inside the housing. Yank the wire to pull it tight, then tug firmly.



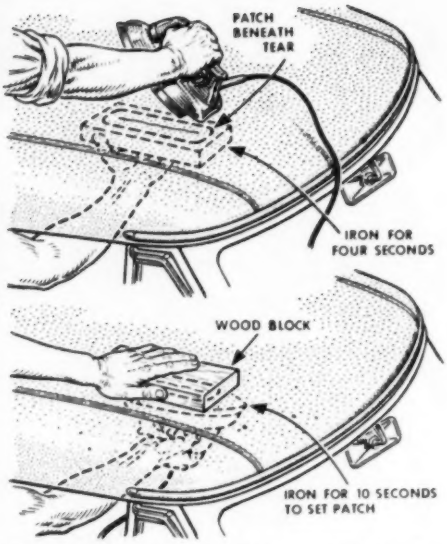
Aluminum foil makes a good reflective lining for tail lights or back-up lights. Cut pieces to fit and press them over dull or rusted reflectors. The lights will shine as bright or brighter than new against the slightly wrinkled aluminum.

Please turn the page for more auto hints.

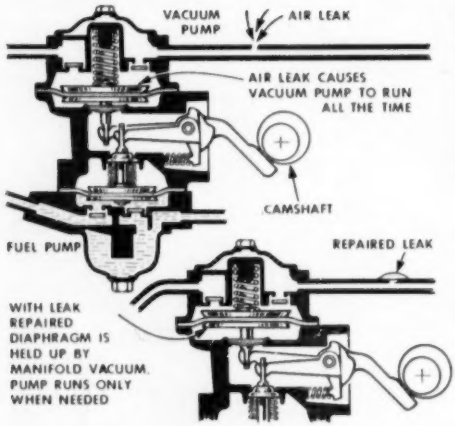
MORE Hints from the Model Garage



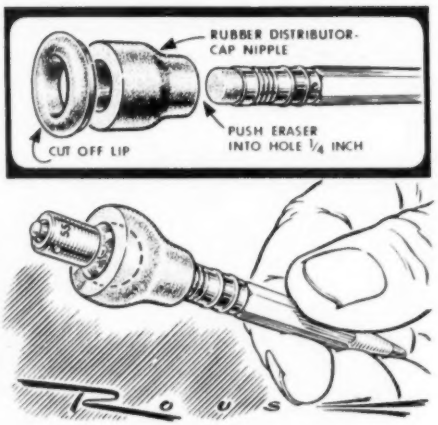
Until you add that garage, here's a temporary one that will keep your car easy to start in winter. Cover a large packing crate with roofing paper and hang a lantern in it for heat. Tack a canvas flap on it to cover the windshield. Runners make it portable.



Rug binding, applied to the underside of a convertible top, patches and waterproofs holes or tears almost invisibly. Back up the patch with a block of wood while you apply a hot iron to the top. Then hold the block over the top and iron the patch.



If, on a top overhaul, you find abnormal wear on the part of the camshaft that operates the fuel-pump arm, look for a leak in the vacuum lines to the wiper, washer or antenna erector. A leaky hose can keep the vacuum-booster pump working constantly, adding greatly to the normal wear on the camshaft eccentric.



A rubber distributor-cap nipple forced over the eraser end of a long pencil makes a convenient extension for removing and replacing the small map-light bulb in '51 Buicks. Slide the ash tray out of the way and press the nipple over the bulb. Twist to the left to remove it. Reverse the procedure to install a new bulb.

"I'll do the job well!"

"Because I have the tools to do it!" When you *know* you're using the finest, your tools and hands really work together. So give your hands all the help you can. *Tool up with Stanley!*

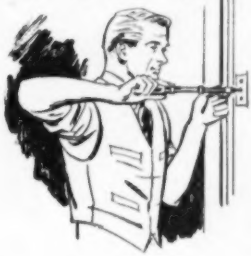
No. 11½

FINEST HAMMER! *Drive the nail in straighter* with the famous *Stanley "100 Plus"! Balanced power* puts more accuracy in every swing. Choice of curved or ripping claw. 16 oz., $3.65 — Western price slightly higher.

No. X 226

FINEST RULE! Take direct readings of inside measurements with the *Stanley "100 Plus"* Zig Zag Extension Rule. Slide and rule reading centered at one point. 6′ rule, 8″ slide. $2.75 wherever fine tools are sold.

"YANKEE"® PUSH DRILL



The drill you use with one hand
Just push — the tool does the work! Lead-holes in a jiffy! No need to use both hands — amazing, quick-return spring brings handle back automatically after each stroke. 8 drill points (1/16″ to 11/64″) in magazine handle for easy selection. A professional drill for only $5.65 wherever fine tools are sold.

No. 41

DO YOU KNOW WHEN TO STOP?

You do when you use the *Stanley No. 47 Bit Gauge* for boring. Will not mar surface — flexible spring bends if boring goes beyond desired depth. Fully adjustable clamp fits all auger bit sizes from 3/16″ to 1″. Only 85¢ wherever fine tools are sold.

No. 47

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FOR ONLY $39.95

No. 0888 — same but without chuck or accessories . . $29.95

Complete with . . .

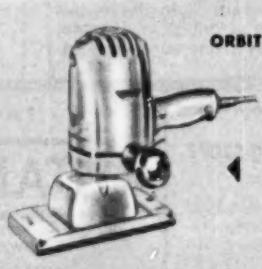
- **3/8-inch Jacobs Geared Key Chuck**
- **6-inch Rubber Pad with Conical Lock Nut**
- **Three 6-inch Sanding Discs**
- **6-inch Lamb's Wool Polishing Bonnet**
- **Spindle Arbor for use with buffing, grinding and wire brush wheels with 1/2" holes**
- **Reversible Side Handle**

BUILT FOR PERFORMANCE

In every detail, this great new tool is designed to give you outstanding performance. For instance, all attachments are driven directly from the spindle (the chuck is used for drilling only). Thus the load is kept close to the bearings — wear and vibration are minimized. Other features include: Rugged, Universal motor with full 4.0 amp. rating . . . N.L. Speed of 3200 r.p.m. . . . drilling capacity 3/8" in metal — 1" in wood . . . trigger switch with lock and automatic release. See for yourself the hundreds of ways this powerful new Millers Falls tool can save you time, work and money. Buy the 888 at your hardware dealer's. If he does not have it in stock, send us his name and we will gladly see that you are supplied.

FREE at your hardware store — Special Catalog on the 888 Power Unit and all its attachments. Or available direct on request.

MILLERS FALLS COMPANY
Dept. PS-3
Greenfield, Mass.

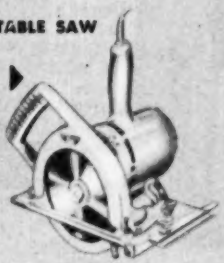


ORBITAL SANDER

A must for fine finishing. Mounts directly on the 888 Power Unit's Spindle and Spindle Housing. Uses standard abrasive sheets cut in thirds — produces "mirror" finish equal to finest cabinet work. No. 882 Orbital Sander **$15.50**

4-INCH PORTABLE SAW

Powered by the 888, this becomes a really fine portable saw. Cut is adjustable from 0" to 1 7/8" deep. Built-in angle adjustment. Ripping guide. Telescoping saw guard. No. 8811 Portable Saw with 6" combination blade **$15.95**



New MILLERS FALLS

888 Power Unit

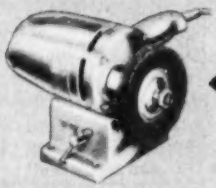
. . the start of a complete power workshop for only $39.95

Greatest time and work saver ever developed! That's what you'll say when you realize how many projects become quick and easy with this new Millers Falls 888 Power Unit and its amazing assortment of beautifully engineered attachments.

Just as it comes, the 888 is three tools in one — a powerful (4.0 amps.) ⅜" drill — a 6" disc sander — and a 6" polisher. Add its attachments, and you have all the power tools shown here. Yet you pay only a fraction of what it would cost to buy individually powered tools for the same work.

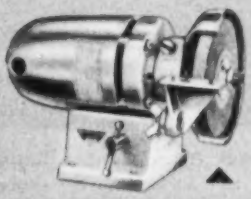
The 888 and its attachments are expertly designed and built to do a real man-sized job. See and try them at your dealer's. Their fine performance will more than meet your expectations. Millers Falls Company, Dept. PS-3, Greenfield, Mass.

To complete your shop just add these inexpensive attachments as you need them



BENCH STAND

Changes the 888 from a portable to a fixed bench power unit. Used with Bench Sander, Bench Grinder, and Bench Jig Saw shown below and at right. Also ideal for use with buffing and wire brush wheels. No. 881 Bench Stand . . $2.95

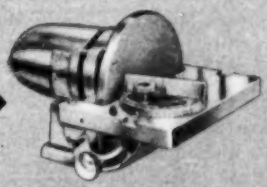


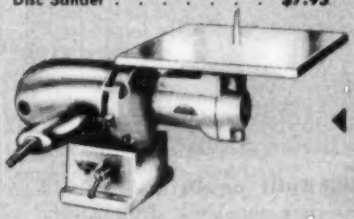
4-INCH BENCH GRINDER

Converts the 888 Power Unit, mounted on the 881 Stand, into a smooth-operating grinder. Adjustable work rest, 4" wheel and wheel arbor. No. 8810 Bench Grinder $5.95

6-INCH DISC BENCH SANDER

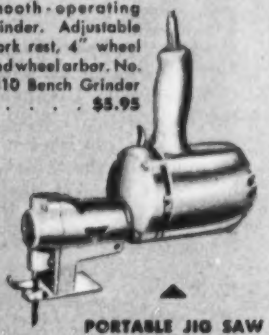
For accurate sanding and metal polishing at angles and even at compound angles. Table—5⅜" x 8"—tilts to 45°. Disc attaches direct to the 888 spindle. Frame bolts to 881 Stand. Complete with angle gauge and abrasive disc. No. 889 Disc Sander $7.95





BENCH JIG SAW

For cutting curves and scroll work. This saw is made up of a heavy steel table 8" x 8" which clamps onto the shoe of the 886 Jig Saw. The 888 Power Unit and 881 Stand complete the assembly. No. 887 Jig Saw Table only . $1.75



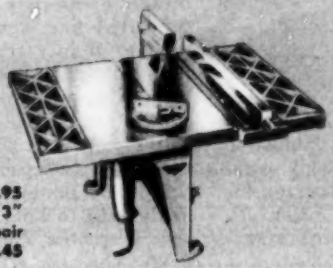
PORTABLE JIG SAW

Attached to the 888 Power Unit, this versatile tool saws curves in ¾" wood or ⅛" metal. Cuts its own starting hole in wood. No. 886 Jig Saw with 4 blades . $9.95

6-INCH BENCH SAW

Driven by the powerful 888 Power Unit, this saw makes cuts up to 1⅝" deep. Table top is 12¼" x 13". Complete with cut-off and mitering gauge, rip fence, combination saw blade.

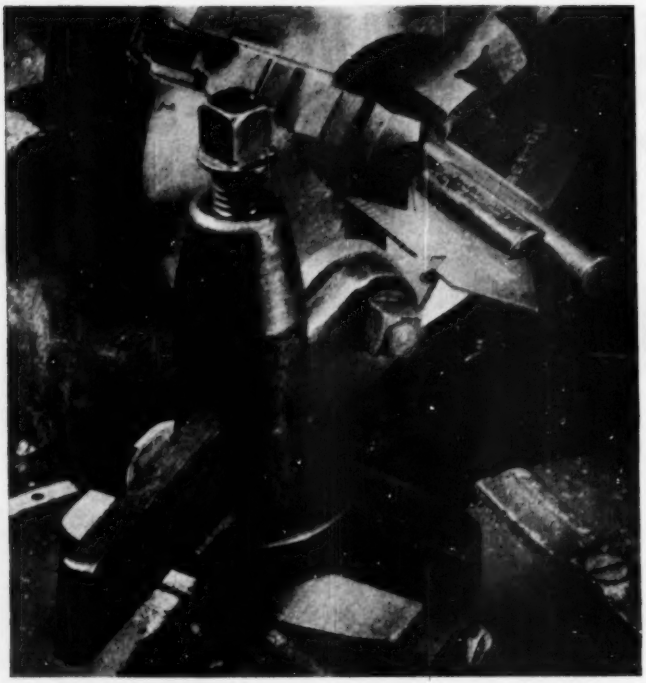
No. 883 — Bench Saw . . . $22.95
No. 884 — Table Extensions, each 3" wide . . . . . $4.95 per pair
No. 885 — Saw Guard $2.45



MILLERS FALLS TOOLS
SINCE 1868

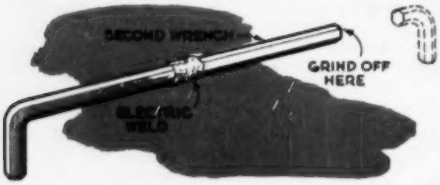
The Mark of Superiority

NEW Shop Ideas

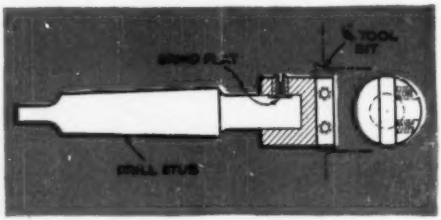


Chuck Your Center Gauge. Both hands are free for setting the threading tool when the center gauge is held as shown here. A purchased V-block mount costing half a dollar is soft-soldered to a length of drill rod, which is chucked so as to hold the gauge at center height. This makes it easy to set the tool level with the gauge as well as in alignment with the V notch. As the holder has a spring clip, the gauge can be removed any time for setting angles by hand.—*Joseph Tracy, NYC.*

Broken Hacksaw Blades Are Still Useful. It's seldom that a hacksaw blade breaks in the middle. Usually the break occurs at the ends. If you have an adjustable saw frame, you can keep the blade in service by annealing the broken end and drilling a hole to fit the next smaller adjustment.



Allen Wrench Extension. Double the length of an Allen wrench by welding the arm of a second wrench to it. This extra-long wrench will have greater leverage for stubborn screws and a longer reach for screws in places that are hard to get at.—*Wilbur H. Fulker, Monument, Colo.*



Boring Tool Built on Drill Shank. A broken or worn taper-shank drill can be converted into a useful adjustable boring tool for use in a lathe's tailstock.

Grind off the fluted part of the drill and make a cap from cold-rolled steel to fit over the stub. Mill a square across the end of the cap for a ¼" lathe tool bit and tap two holes for setscrews to lock it in place. Grind a flat on the stub for a heavy setscrew in the cap to hold the two parts together and keep the cap from turning.—*Roger Isetts, Kenosha, Wis.*

Please turn to page 260 for more shop ideas.

News About Glues

FOR "DO-IT-YOURSELFERS"

FROM UNITED STATES PLYWOOD CORPORATION
World's Largest Plywood Organization

NOW THERE'S A WIZARD WITH WOOD FOR EVERY GLUING JOB

New! Amazing Cement Glues Without Clamps.

LOOK FOR THE WELDWOOD NAME ON THE YELLOW AND BLACK LABEL!

Weldwood CONTACT CEMENT

A revolutionary new concept in gluing. *First* it dries, *then* you make the bond. And the bond is made instantly, permanently, on contact. No clamps, no presses, no nails. It's a wonderful new tool for do-it-yourselfers. 25¢, 35¢, 60¢ and larger sizes.

3 BIG USES

1. For applying plastic laminates like Micarta or Formica to counters, tables, etc.

2. For applying plywood wall panels without nails (no unsightly nail holes — no puttying).

3. For making or mending things made of wood, metal (including aluminum), cloth, felt, paper—1001 uses around home, shop, garage.

America's fastest selling wood glue

Weldwood®
***Plastic Resin* GLUE**

Makes joints actually stronger than the wood itself. Highly water-resistant, stain-free, rot-proof. First choice of amateur and professional restorers, cabinet makers, wood workers. For making or mending things, it's deservedly America's most popular wood glue.

Another new WIZARD with WOOD

Weldwood PRESTO-SET* GLUE

Ready to use! Sets fast! Bonds like magic! It's the perfected white glue, worthy of the Weldwood name. Especially developed for do-it-yourselfers. Doesn't spoil or stain. Works like a wizard on just about everything made of wood, cloth, leather, fibre, paper, etc.

And for a perfect finish, use *these* WIZARDS with WOOD

FIRZITE®—Use WHITE FIRZITE on any wood to get those rich "woodsy" blond or pickled effects. (For pastel tones, tint with colors-in-oil.) A "must" undercoater on fir plywood. Use CLEAR FIRZITE to tame that wild grain on fir plywood.

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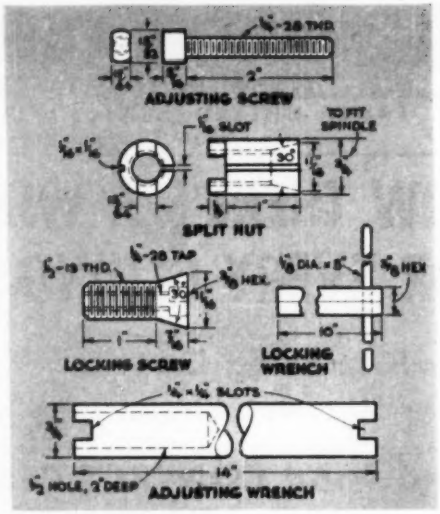
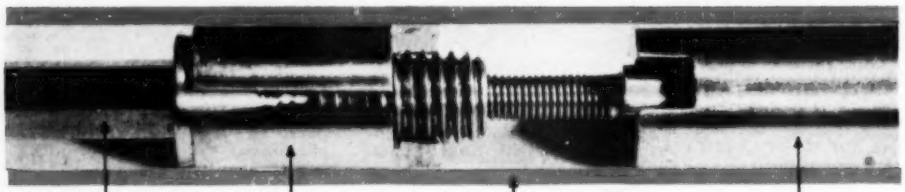
MORE SHOP TIPS

Spindle Stop Speeds Repeat Operations. Quickly locked in place anywhere along the length of a lathe headstock spindle, this work stop enables you to position duplicate workpieces accurately.

The stop itself is made in three parts: a ½" Allen-head screw (1) with the head tapered to expand a slotted split nut (2), turned from 1" cold-rolled steel rod; and a ¼"-28 thread-adjusting screw (3) that turns in a tapped hole in the altered Allen-head screw. A long key made from hex rod is used to lock the stop in the approximate position in the spindle, after which a slotted rod is inserted from the chuck end to turn the adjusting screw in or out to the exact setting.—*Leonard A. Kroll, Brooklyn, N. Y.*

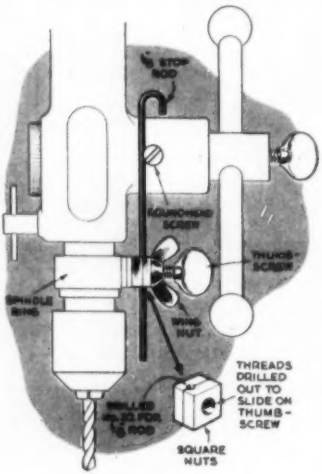




Depth Stop Modernizes Old Drill Press. Most current-model drill presses come equipped with a depth stop for drilling blind holes to any desired depth, but some of the older ones don't have this convenience.

If yours is the latter type, you can bring it up to date with this stop made from a length of ⅜" rod and a few nuts.

Replace the setscrew in the spindle ring with a thumbscrew long enough to allow a wing nut and two square nuts to fit on the exposed threads between the ring and the flathead. Drill the threads out of the nuts so they'll slide on the thumbscrew. Clamp them together and drill a hole through their edges for the stop rod.



Form a hook on one end of the ⅜" rod and insert it in the hole drilled in the two square nuts. Lock it in a vertical position by tightening the wing nut and drill and tap a hole in the casting that houses the hand-feed lever shaft. Drive a roundhead screw in this hole, leaving about 3/16" projecting to engage the hook on the stop rod.

To set the stop, bring the spindle down to the required depth, pull the hooked rod down on the roundhead screw and tighten the wing nut against the square nuts, locking the rod. As the drill is fed into the work, it will move down until the hook comes in contact with the stop screw.—*Joseph Ragno, Berwick, Pa.*

5 BIG POWER TOOLS IN ONE
FACTORY TO YOU $79.95

Only SUPERSHOP can offer you a complete precision-built workshop for $16 per tool. 100% Ball Bearing. Lifetime accuracy. Rugged frame of heavy steel tubing. Handles big jobs. 8" saw. Sold direct from factory to save you $65.05. FREE trial. Easy pay plan. Free Catalog.

Write for FREE Catalog

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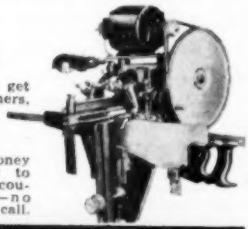
Make $20 to $30 a Week EXTRA MONEY!

With the high prices of food, clothing and everything else, just think what you could do with extra money every week! Turn your spare time into CASH—sharpening saws with a Foley Automatic Saw Filer pays up to $3 or $4 an hour. Start in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws"—says M. L. Thompson. With a Foley you can file all hand saws, also band and cross-cut circular saws.

FREE BOOK

Shows How to Start

It explains how you can get business from home owners, farmers, carpenters, schools, factories, etc. "I get work from 20 and 30 miles away"—says Charles H. Smith. Free Book, "Money Making Facts," tells how to start. Send coupon today—no salesman will call.



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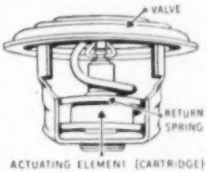
Care and Feeding of Engines

BY S. P. CORP

WHEN THERMOSTATS DON'T WORK

If your radiator has ever boiled dry, your thermostat may have been damaged. This would make your engine run too cool, wasting oil and gas. To test thermostat, place a .003" feeler ribbon ⅛" under lip of valve and submerge it in a container of water, 1" from bottom. Hang a thermometer in the water so the bulb is same height as thermostat. Heat slowly and stir to equalize temperature.



If thermostat drops off ribbon upon immersion, or if it opens 5° too soon or too late, you need a new thermostat.

Standard thermostats should start to open at 148° to 155° and be fully open at 175°. High-opening thermostats should start at 178° to 185°, and be wide open at 211°. When installing a new thermostat, use new gaskets and be sure side openings are placed to let water flow.

CAR RADIO STATIC

If your car radio clicks annoyingly, even when tuned between stations, it may be due to static caused by tires on certain kinds of pavement. Apply brakes lightly. If static decreases, it's tire static, and you should have static collectors on front wheels checked to see if they are greasy, or incorrectly installed. You may have to use a special static-eliminator powder, available at your parts supplier.

GET THIS FREE MANUAL

Worn piston rings are the most serious cause of wasted oil, wasted gas, and lost power. Re-ring with Sealed Power KromeX Ring Sets for immediate oil control, easy starting, and better than double normal ring mileage! Chrome-faced top compression ring and chrome faces on side rails of MD-50 Steel Oil Ring protect each KromeX Ring Set against heat, friction, abrasion and corrosion. To get your free copy of the valuable illustrated manual, "MORE POWER, Less Gas, Less Oil," address a card to Sealed Power, Dept. H-9, Muskegon, Mich.

Sealed Power
PISTON RINGS

He Builds TV Actors to Order

[Continued from page 142]

speaking in the voices of their characters. Each operator has at least five voices. But the appearance of a character has so much to do with the way he comes over that even the same voice may seem to sound different with different characters.

On rare occasions a string pops. When this happens, the puppet can usually be worked with other strings. On TV, the Bairds use the strongest strings possible. "We don't mind if people see the strings," Bil says, "but still we try to minimize them."

In movies he uses very fine strings, because if they break the film can be reshot after the strings are fixed.

The Bairds, with help of a staff of people, build all the stuff for their shows. They require that all their operators also be builders. Says Bil: "You must be able to put 'em together, or you can't fix 'em to work as you want, or fix 'em if anything goes wrong."

From Idea to Reality—250 Hours' Work

A character starts as an idea in someone's head. Then he is drawn by Bil. Once he looks good on paper he is started. There are about 250 man-hours of work on a single one. "Each," says Bil, "is dreamed up differently, depending on what his function will be. Dancers have long legs and loose hips; a fiddle player may have a swivel waist so he can lean and sway as he plays."

All kinds of material go into this cast—aluminum, steel, plastic, nylon, wood, wool felt. Bil keeps a vast collection of priceless junk, including old piano parts, in his studio for purposes of construction. "He never throws anything away," Cora says.

Successful today, Bil Baird is an example of a man who knew what he wanted to do years ago and stuck to it. When he was a kid of seven in Detroit, his father made him his first puppet. Later, Bil made the first one of his own manufacture—Judy, of Punch and Judy. He still has this one. At the University of Iowa, Baird majored in art and biology (for anatomy) so he could learn to build puppets better.

"But," says Bil, "there's no school for this business; you just begin." Bil opened the first show of his own at the Chicago World's Fair in 1934.

The Bairds produce two complete new numbers a day. This keeps things moving. They are up around four or five a.m., and at the studio by 5:30 to prepare for their seven a.m. show. They are on the air three hours, till 10 (one hour of their two-hour show is repeated for the West). Then they rehearse the next day's show.

Everyone Gets into the Act

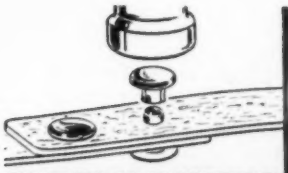
In the afternoons the company rehearses shows for the future. After a record has been decided upon, and puppets have been built, they are tried out on a rehearsal stage in Bil's coach house.

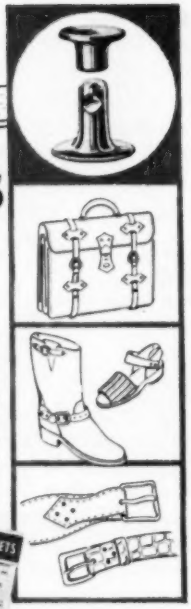
The operators constantly watch a big mirror in front of the stage. Then whoever had the best idea for handling the bit sketches out a routine while the others make suggestions. One of the company directs until he is needed in the number; then he gets on the bridge.

A routine can go in almost any direction. There are comedies. There is tragicomedy. A number to the tune of *There's Nobody Here But Us Chickens* ended with a rooster being carried off by a hand around his neck. There are numbers that do the opposite of what the record is playing. There are even Biblical numbers—Jonah and the Whale, Noah and the Ark, Adam and Eve. "I don't know," says Bil, "whether Adam would recognize the Creation with all the animals singing in the chorus." END

Cold Shoulder

Now, the modern man comes home from work and greets his wife with, "Hyah, honey, what's thawing?"—*L & N Magazine.*





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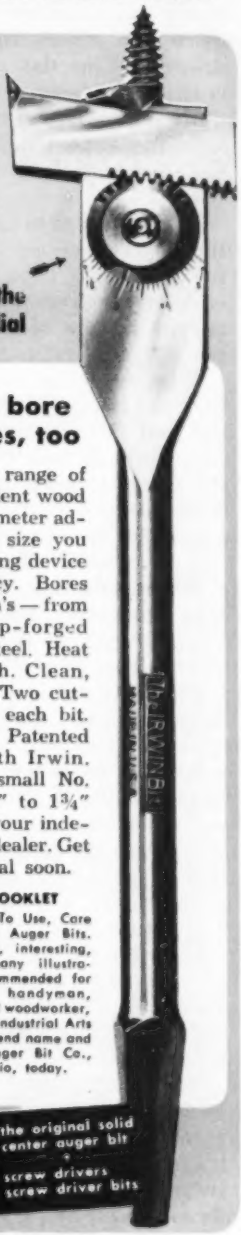

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Building a Pocket Radio

[Continued from page 205]

To permit easy shifting of the transistors and avoid damaging them with soldering heat, I recommend using five-prong subminiature tube sockets. Remove two prongs from each as in the drawing. Clip the transistor leads short and carefully bend them to enter the proper socket holes.

Eyelets set into the panel serve as tie points and help anchor down both ends of every component, which is important in view of the handling a portable gets.

Wire the set as in the sequence drawings and the keyed instructions on pages 206 and 207. Be sure to mark the collector side of each transistor socket and the positive battery clip with red paint. Remember that the positive side is grounded, the opposite of tube circuits. Any reversal will destroy the transistors.

When soldering in the tiny electrolytic condensers, hold the lead between the soldered joint and the can with pliers to keep heat from damaging the unit.

Checking regeneration. When everything has been wired and double- (or triple- !) checked, temporarily connect earphones across the red and blue transformer leads. If you have a low-range milliammeter, temporarily connect it in series with the battery, taking care that battery polarity is correct with respect to the circuit. Then insert only transistor 1 and turn on the switch.

With the tuning slug fully in and R3 at or near zero resistance, the meter should read about .2 ma. and you should hear a raucous squawk in the phones, indicating regeneration.

If with an oscillation-tested transistor in the socket the detector fails to regenerate, disconnect and reverse the L2 leads. (Be sure you always shut the switch off before pulling a transistor from its socket.)

In the set shown, L2 is centered over the end of coil L1. It may be necessary to rewind L2 farther up on the coil sleeve to get regeneration over enough of the broadcast band, or to add a few extra turns. Increasing the value of R2 to as much as 50,000 ohms will make some transistors oscillate over more of the range, but do not allow current to rise above .5 ma.

If, on the other hand, regeneration is so harsh that it cannot be controlled with R3, you may have to remove a turn or two from L2 or rewind it farther from L1.

With the detector working, check the amplifier stage by removing transistor 1 (switch off!) and inserting transistor 2. You may get a meter reading from .2 to 1.5 ma. For best results and long battery life, substitute other values for R5 if necessary to bring the current down to about .5 ma. Some CK722s tested drew less than .5 ma. with no resistor at all. In this case, you can omit both R5 and C9.

Now you're set to try for stations. In suburban areas, good reception is possible with the antenna clip on the dialing stop of a telephone, no ground being necessary. With a ground wire (led to the battery-plus clip) bedsprings or a window screen may serve as an antenna.

Best results are had with a good pair of high impedance (2,000 ohms) earphones, but you could use a magnetic hearing-aid phone. Always plug phones in before turning on the switch.

Control R3 must be worked in conjunction with the tuning knob. If there are no strong stations near, omit C1 and connect your antenna right to the coil. If stations overlap, try a smaller C1.

Want it larger? If you don't care about portability, you can use larger parts. The compact tuning system specified regenerates from 650 to 1,300 kc. in the set shown. You can probably reach a favorite way up on the dial by using a 365 mmfd. condenser in place of C2. END

HINT TO AN UNHANDY HANDY MAN

Wood putty can cover
Defects in the wood
But can't hide bad botches
You hoped that it could.

—Berton Braley

Make sure you put the right parts into your FORD

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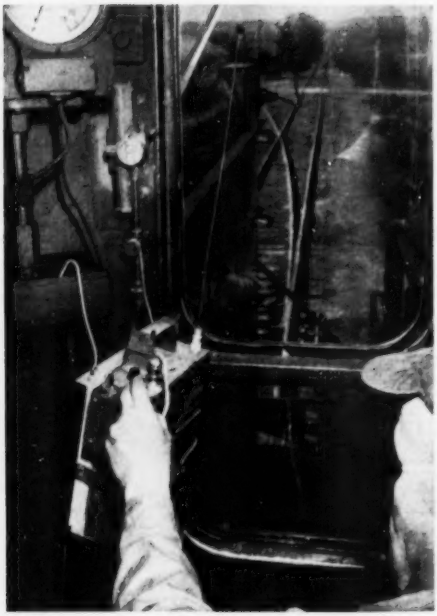
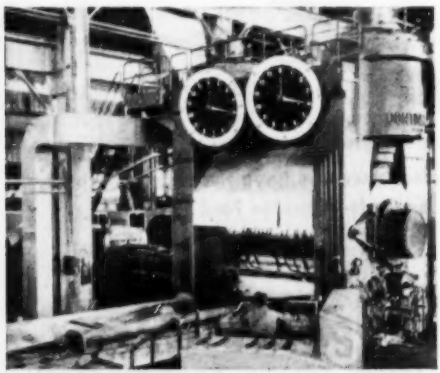


Radio Throws Train Switch

THIS engineer switches his own train by pushing buttons on a walkie-talkie. An oscillator that replaces the mike opens and closes distant switches by tone. Santa Fe trains use the system to make nonstop runs to and from a potash mine.

Sander Cleans Hot Shoes

A BELT sander hooked up with a vacuum cleaner whisks radioactive dust from shoe soles (above) at the Brookhaven atomic lab. Every few months, the belt itself has to be decontaminated so it won't just swap radiation with the shoes brought to it.



Mill Tapers Airplane Wing Skins

THE huge mill above puts the screws on aluminum to roll tapered wing skins for big planes like the B-52. The skins decrease in thickness from fuselage to wingtip. As the 10-foot-wide ribbon rolls out, two big dials tell Alcoa men its thickness.

Dust Mask Also Cools Air

AIR breathed by this farmer is degrees cooler than the air around him—he inhales through a damp sponge in the mask. Exhaled air is drawn away by tractor's vacuum system. General Scientific Co., 27th and Huntingdon Sts., Phila., makes the mask.

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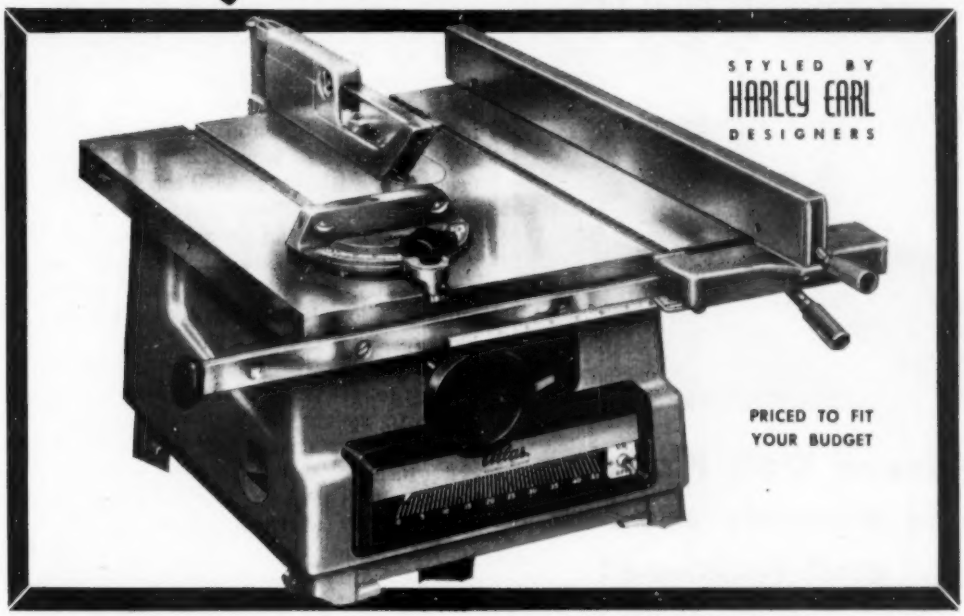

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How to Heat with Electricity

[*Continued from page 109*]

means that it costs 1¾ cents to run one panel for one hour.

At this price, electric heating costs no more than oil or gas. Power bills for the modest, two-bedroom New Jersey houses, including heat, light and all other electric appliances, range from $250 to $300—*a year*. Highest bill was $370 for an eight-room house.

It depends on where you live. Individual users of electric heat throughout the country pay anywhere from seven mills a kilowatt-hour to five cents or more.

The practical heating areas are those where the rate is two cents or less. If you figure in special savings—no chimney, installation cost about half that of other systems, and low maintenance on a system that will probably outlast you—you may go a bit above two cents and still get by. Beyond that, it may tend to become a luxury.

What if the power fails? This, say the utilities, doesn't happen as often as you'd think. Cities have a breakdown only once in every five or six years; rural areas, slightly more often.

A Nebraska lady whose power was off for 94 hours during an ice storm, insists that she was no worse off than her neighbors—they had electrically stoked coal furnaces or electrically operated oil burners that wouldn't run with the power off either.

When will it come? The Continental Radiant Glass Heating Corp., which supplies the panels, already has close to half a million installations throughout the country. By 1960, the company estimates, 25 percent of all U.S. homes will be keeping warm with kilowatts. END

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(Anode to Electricians)

On current news they have the pitch
  On watt is watt and which is switch;
From pole to pole they roam
  And always have the best connections
Along the line, so any sections
  To them are ohm sweet ohm.

—BERTON BRALEY

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HYDRA-GLIDE®

How to Modernize Your Power Supply

[Continued from page 138]

you need a socket for a background lamp or maybe even a popcorn popper. At the head of the bed, there should be receptacles for clock, lamps, radio, blanket or whatever other electrical appliances you need for sleeping.

Extra outlets may also be needed where you park the table for buffets, or for dining.

Single or double outlets can be replaced by triple outlets or, if necessary, by a larger box with extra fixtures. An outlet can also have a short run of cable tapped into it, to be snaked through the wall to a new box on the next stud. Either of these wiring jobs can be accomplished without doing any damage to the decorations.

It may not be necessary to call in an electrician for some of the simpler jobs. The average home mechanic can replace a single outlet with a multiple one. Remember to pull the switch or fuse on the circuit being altered. Some manufacturers have made such jobs very simple by coming out with receptacles in which it is not necessary to twist the wires around the terminals.

You just skin the wires according to a gauge molded in the shell, and poke the wires in holes.

Other manufacturers supply electrical conduit in the form of molding with outlets built in at various intervals, or with provisions for surface outlets. Using such devices, it might be feasible for the homeowner to run in a complete branch circuit. But before you tamper with any wiring, check the local codes. END

He Ignores Signs

"Don't you see that sign?" The ticket collector glared at the male passenger on a Long Island commuter train who was puffing a cigar in a car labeled, "No Smoking."

"Sure do," the traveler grinned, "but this car is full of crazy signs. That one up there says, 'Wear Elite Brassieres.' "—*Railroad Magazine.*

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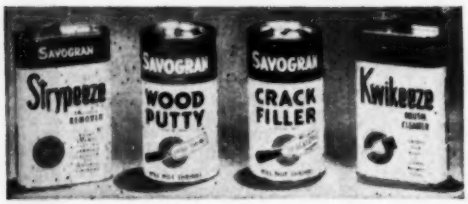

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[*Continued from page 232*]

tapping and boring. Biggest advantage of the device is that travel is always recorded from zero on its scale. Mounted alongside the tailstock, the depth gauge consists of a gauge rod and depth rod connected by the depth recorder. As the depth rod is moved forward on a drilling job, it drags the indicator bar along the recorder rod, showing exactly how far the tool has moved.

Other pet lathe accessories that Moore has built for himself include an extra-solid tool-post turret, a floating reamer mount, a spring winder, and a gadget for squaring shafts.

Drill-press gizmos. On his two drill presses Moore has also made some interesting changes. Tired of horsing the heavy tables up or down, he fitted the larger press with a geared elevating mechanism and the smaller one with a pulley system using 1,000-pound nylon cord. Belt-tightening cams of his own design and a lamp mounted inside the upper frame of each press also aid drilling efficiency.

One of Moore's most useful drill-press tools is a tap wrench that clamps on the chuck. Since it is turned by lateral handles, applied pressure is steady and moderate, and tap breakage is almost nil.

From fairly small attachments, Moore also can go to bigger projects if some job calls for it. Not long ago he needed a heavy-duty tool for punching and shaping metal. To get his big push, he mounted a five-ton truck jack in a frame made of beefy steel rod and bar. Presto! —he had a 10,000-pound hydraulic press.

As in most home workshops, there is a space problem. There is only so much footage wall to wall, and 17 stationary power tools, a dozen or so portable power models and about 650 hand tools can be compressed only so far.

One of his solutions is to mount one end of a power tool or bench on casters, leaving the other end on standard legs. This produces mobility without skittishness. The tools and bench roll easily

[*Continued on page 274*]

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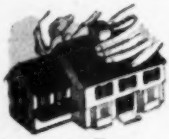

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NEW EASY-SEAL TOP
HAS HANDY APPLICATOR TIP

DU PONT

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

[*Continued from page 272*]

enough to be pushed around wherever they're most convenient. Caster-fitted legs, of course, are shorter than standard ones.

Another space saver is the side-by-side arrangement of circular saw and shaper that allows Moore to slide work from one table to the other. This, plus the diagonal placement of these two tools in the largest part of the shop, prevents many an awkward collision between long stock and the other tools and breakable items around the room. Finally, to assure that using his woodworking tools would be convenient and pleasurable, Moore built four permanent mitering guides cut to commonly used angles.

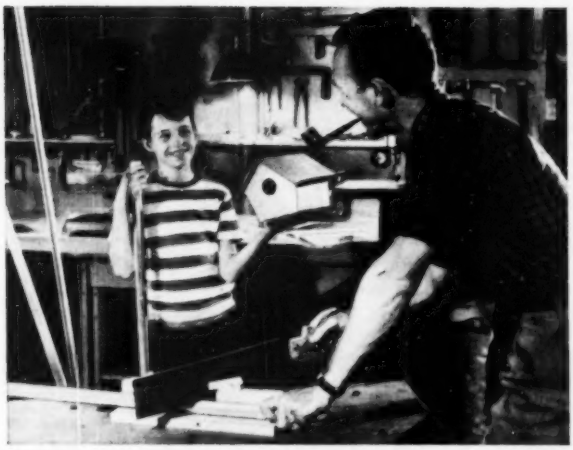
End product. What is the result of all this ingenious technology and housekeeping?

Well, his inlaid wood cases for small tools are beautiful. He glues the inlays, made of contrasting woods, to his own paper patterns and fits these into routings in the case surfaces. Since the interior of each case is cut out to receive only predetermined tools, Moore never needs to play jackstraws to find the proper micrometer or drill pad.

Sharing space with the many trophy heads in the Moores' den is some of his best work. Starting with two rhinoceros feet he happened to have around, Moore turned out as fine a pair of end tables as you'll find this side of Victoria Falls. The feet were tanned, filled with plaster, and lined with a circular sleeve. Then he mounted rock maple legs and tops on them. Zebra skin, glued to the top and protected by glass, gives an ultimate African air to the two pieces. Similar work produced a coffee table from an elephant's foot.

A bit more bizarre, if not downright jolting at first, is a lion's skull mounted atop a redwood burl and hung against one wall of the den. It's a planter, with ivy twining up through the jaws and fangs. END

See* Popular Science Monthly *next issue for a story on another fellow's shop.



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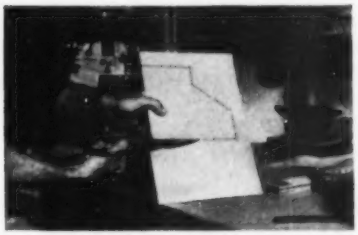
Reynolds *Do-It-Yourself* Aluminum has been called the metal you can whittle. You can use a pocket knife to cut it or to remove burrs after sawing.



A sharp pair of ordinary household scissors or tin snips will readily cut sheet. Scissors are actually easier to use for more intricate curves.

Power drills may be used or conventional wood expansion bits are very effective for boring holes in sheet. Regular auger bits work equally well.

REYNOLDS
*DO-IT-YOURSELF**
ALUMINUM

*T. M. REYNOLDS METALS COMPANY

Reynolds Aluminum Service Corporation
2493 South Third Street
Louisville 1, Kentucky

- ☐ Enclosed is 50c. Please send me *Project Book No. 1*
- ☐ Please send me complete information about Reynolds *Do-It-Yourself* Aluminum.
- ☐ Please send me FREE list of Patterns and Plans.

Name .....

Address .....

City ..... Zone ..... State .....

Reynolds *Do-It-Yourself* Aluminum is also available in Canada.

NEW ROOM

ONLY $16* A MONTH

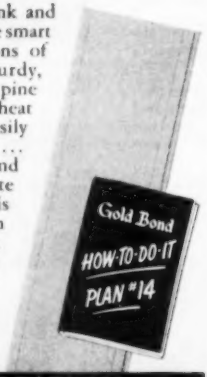
with triple value Gold Bond Insulation Board

Add a new attic room like this with easy-to-handle Gold Bond Insulation Board on walls and ceiling. It decorates, insulates *and* sound-conditions!

Gold Bond Insulation Plank and Tile are pre-finished and give smart good looks in combinations of ivory or pastel colors. Sturdy, made from "live" southern pine fibres, they keep furnace heat *in*, and summer heat *out!* Easily applied with a stapling gun... available at your Gold Bond dealer's. Send for complete plans on how to build this room or one similar—then see your Gold Bond dealer.

** Based on cost of materials spread over 24 months. Prices vary slightly in some localities.*

NATIONAL GYPSUM CO.
BUFFALO 2, N. Y.



SEND 10¢ FOR PLAN

NATIONAL GYPSUM COMPANY
Dept. PS-94, Buffalo 2, N. Y.

Enclosed is 10¢ for Gold Bond How-To-Do-It Plan No. 14 for building this attractive room in our attic.

Name.....

Address.....

City..... *Zone*.... *County*..... *State*.....

How to Be Different

[*Continued from page 111*]

story, because if they hadn't substituted imagination and energy for professional help, there wouldn't be a house.

Having no previous building experience, the Freys were completely uninhibited by conventional methods. That's one reason why the house is so attractive.

Straying from the conventional had other favorable points, too. Costs, for instance. The usual staircase would have cost $165 and made the foyer narrow and dark. The Frey design, just as functional and much more unusual, cost only $24.15, including the rope banister.

Because the Freys did all the work themselves they could afford to change their minds whenever a better idea presented itself.

"You know," Emil remarked one day as he nailed the last stud in place in the foyer wall, "I think we could have made this whole area look more dramatic if this one wall had been curved."

"Why didn't we think of that before!" Jeanne wailed.

"It's never too late," said Emil.

So they tore out the studding and rebuilt the wall into one long sweeping curve from the entrance to the studio door on the balcony.

The 40-by-26-foot, 1½-story house—the half-story is the lower one, as the house is built against a hill—and practically all furniture were Frey designed and built.

Modern Magic

The lamps on the wall by the built-in piano, for instance, are ultramodern, like everything else in the house. But look closer. They turn out to be two ordinary gooseneck desk lamps, painted and fitted with shades. How would you know that the shades were a brace of tin cans?

Or that the decorative metal frieze on the recently finished couch in the living room is just a strip of polished brass from a stamping machine? Or take the clock in the dining nook, obviously a chi-chi piece from an exclusive shop on Fifth Avenue, New York. Actually, it's an old

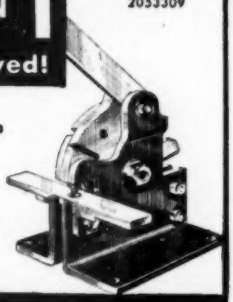
[*Continued on page 278*]

BACK AGAIN!

4 TOOLS IN 1

Bigger! Improved!

Patent No. 2053309



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Now this one compact unit offers more than ever before. Five punch sizes . . . bigger . . . handles larger stock . . . simplified operation . . . does more. The perfect all-purpose tool for hobbyists, craftsmen, radio repair, metal shops, model manufacturers, experimental laboratories, etc.

SPECIAL — Threading dies for 1/8", 5/32" and 3/16" stock included for only $1.00 extra.

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WILLIAMSVILLE, N. Y.

TOUCH UP nicks, scratches, bruises with "MATCH-IT" spray bomb lacquer

mixed-to-match YOUR CAR'S COLOR!

WE GUARANTEE to match any original finish on any model from 1940 on!

Now with MATCH-IT, the amazing new, *matching* spray lacquer, you can remove unsightly stone bruises, door nicks, scratches and other finish blemishes . . . or paint fender skirts, sun visors and similar accessories in a matter of minutes—with no muss! no fuss!

YOU JUST PUSH A BUTTON and the MATCH-IT can's fine mist nozzle applies a beautiful high gloss lacquer that dries in minutes to a gleaming luster without rubbing . . . giving you the equal of an expensive, professional job.

CUSTOM MATCHING to your car's finish. The makers of MATCH-IT use the same mixture and paints as were applied by the manufacturer in the original finish on your car. MATCH-IT is *guaranteed* to match within one per cent of original factory color! CAUTION! MATCH-IT is mixed to match original factory finishes only—not repaints. (NOTE: Where primer is needed, order MATCH-IT automotive primer, 6 oz. can, $2.00; 12 oz. can, $3.00)

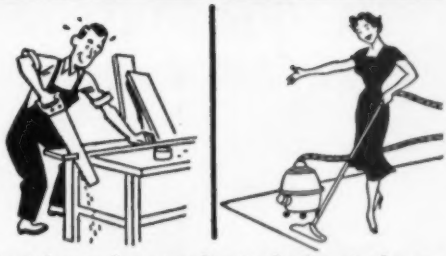
YOU SAVE THE COST of a COMMERCIAL JOB by doing it yourself. Refinishing a scratched area on your car costs only pennies instead of dollars. MATCH-IT's new self pressurized paint and spray head enables you to *spray* paint on like a professional. . . . Anyone—even a child can do it!

REFRIGERATORS, WASHERS, KITCHEN CABINETS can also be spray painted with MATCH-IT's beautiful, long-wearing Appliance White. Also available in modern Wrought-Iron, Flat Black

PREVENT destructive rust and corrosion in the winter months ahead. Just write the make, year and original paint color of your car on a piece of paper, and enclose it with check or M.O. for $3.00 in an envelope addressed to:

MILWAUKEE paint products co., inc.
Dept. S-1, 2688 W. North Ave., Milwaukee 5, Wis.

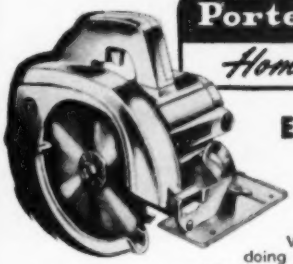
SHE cleans the easy way . . . but HOW DO YOU SAW?



Here's how to eliminate exhausting hand-sawing forever ..for less than the cost of your wife's vacuum cleaner!

Get this NEW 6-inch

Porter-Cable *Homemaster*



ELECTRIC SAW

When it comes to doing things the easy way, Mister, your wife's way out in front! **She** takes advantage of modern labor-saving devices. Isn't it about time **you** caught up?

Take sawing. Why do it the slow, tiresome way? For only $49.50 you can get this Homemaster Portable Electric Saw that rips . . cross cuts . . angle-cuts . . bevels . . . notches . . ten times faster and a hundred times easier!

There must be dozens of things you've always wanted to build—but avoided because of the backbreaking hand-sawing involved. Now, do them with this saw! And without the aches and pains.

Compare these features: kick-proof clutch (exclusive), big 8 amp motor, depth and angle adjustments, 6" combination blade, ball bearings, telescoping guard, **fully guaranteed.** Converts to saw table. An outstanding "Do It Yourself" tool!

ONLY **$49.50**
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Here you get practical help and experienced counsel from the same experts who advise and supply the professional builders. You get the kind of hand and power tools, the quality of hardboards and hardware, plywood and paint, cabinets, millwork and floor coverings your professional builder buys. You'll find appliances, too, and garden tools, garden supplies and garden furniture at your building material dealer's.

Yes, the Lumber & Building Material Dealer in your community is your one best, one-stop source of ALL building and craft needs—all "do-it-yourself" tools and supplies. Buy from him, get expert service . . . and save.

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How to Be Different

[*Continued from page 276*]

electric office clock, conventionally round, conventionally faced, conventionally lettered and—when Emil got it—busted.

"It wouldn't run," Emil says, "so I soaked it in kerosene, and it dried, and then it ran okay."

Jeanne removed the glass over the face, painted the whole thing a dull black, brushed on some modernistic streaks for the hours and hung it.

The house was actually a well-planned undertaking. Jeanne is a fine-arts graduate of Yale University; Emil is an account executive for a New York advertising agency. They planned each feature together, and Jeanne made drawings.

Converting a Dream into Reality

Emil's qualifications as a carpenter were not impressive. ("You mean," he once said in awe, "that there are *two* kinds of hammers?") The fact is that they didn't realize what they were getting into. On paper—and in their library of how-to-do-it literature—it looked quite simple, but they soon discovered that they had a tiger by the tail.

They were always looking for ways to save time. Redrawing and recutting of a paper pattern was the quickie trick for the design of the snack-bar counter top. A paper pattern also speeded up designing of the dining-table top.

When they wanted to bullnose the end of a wall, Jeanne discovered an easier method than having a metal template cut to order. She covered the butt with wet plaster and pulled a strip of heavy plastic fabric, held U-shaped, down it.

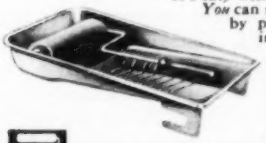
A hill at the side of the house began to give erosion trouble, so Emil dug trenches and laid tile for drainage. The water basins had to be covered with strong gratings, and if you look closely you will discover that they were cut from the curlicued iron legs of an old sewing machine.

Jeanne didn't go to a tinsmith for liners when she wanted special-sized

[*Continued on page 280*]

You CAN PAINT THE THOMAS WAY...AND SAVE!

"I help my husband with *all* the painting. It's *easy* with a Thomas Paint Roller! *You* can save time and money, too, by painting your walls, ceilings, floors, fences, boats, farm buildings—with a THOMAS roller."



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But fine, drop forged UTICA® pliers and adjustable wrenches are a pleasure to use—because they make the job easier, quicker, better.

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Good engine performance is vital to the big truck fleets who move the nation's merchandise on its way to market.

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Federal-Mogul engine bearings can restore dependable engine performance for *you*, in your driving for business or pleasure. They have led in the replacement field for 30 years . . . because of quality! *Ask your mechanic!* FEDERAL-MOGUL SERVICE, Division Federal-Mogul Corporation, Detroit 13, Michigan.

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FEDERAL-MOGUL

Oil Control Bearings

BEARING MANUFACTURERS TO THE AUTOMOTIVE INDUSTRY SINCE 1899

BEARING FEDERAL Mogul SERVICE

How to Be Different

[*Continued from page 278*]

"planters" for her indoor greenery. Instead she went to the cupboard for bread pans. Scrap lumber made the boxes.

The most dramatic feature of the living room is the successful solution of what to do with their old piano. They built it in. With only the white keyboard showing against a black striated-plywood wall, it looks like a $1,000 idea from an exclusive decorators' bazaar.

For unusual projects, resourcefulness became second nature. Driftwood from the lakeshore became decorator lamps; bent aluminum bars, painted dull black, made their debut as "wrought-iron" legs on their coffee table. Oversized radios were dismantled and built into walls.

It would be pleasant to report that the Freys made no mistakes, but that would be stretching the truth.

The first kitchen-cabinet doors were of half-inch marine plywood that warped so badly they had to be replaced by ¾-inch plywood stock, and even these warped.

Wrong Season—Wrong Seasoning

The hardwood oak floor in the living room shows separation between the boards. When Emil laid it in the summer, it was as snug as a gremlin's nest. He thinks perhaps he should have put it down in the winter when the humidity was low.

After four years of weekend building, the house as originally planned is complete. However, future projects call for an extra bedroom addition and a two-car garage.

The Freys believe that it not only pays handsomely, costwise, to build your own house, but in other ways as well. More important is the feeling of accomplishment, learning to work together as a team, the satisfaction of licking the toughest problems.

Jeanne has only one complaint: "Every time I save for something special I always lose out to more two-by-fours!" END

NEXT MONTH in* Popular Science Monthly: *Full-color photos will show how TV color pictures are painted with light.

DO-IT-YOURSELF!

Modernize with prefinished

MARLITE PLANK & BLOCK

A hammer, saw, and level are all you need for beautiful walls, quickly installed. Planks (16" x 8') and Blocks (16" square) with exclusive tongue and groove joint are easily applied over old or new walls. Soilproof baked finish fused to a tempered hardboard never needs painting, cleans with a damp cloth. Ten "Companion Colors," plus 4 distinctive wood patterns, practical for every home interior.

Write for free folder and do-it-yourself instructions, or see your lumber dealer. Marsh Wall Products, Inc., Dept. 926, Dover, Ohio. Subsidiary of Masonite Corp.

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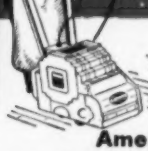

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Why pay a high price to have your rough, stained, scratched floors refinished? Sand them yourself with a Little American! The job is quick, safe, easy with this perfectly balanced drum sander. Look for the *lever* on the handle—it assures even drum pressure and even sanding under *all* floor conditions. Thousands of home-owners have used this machine to restore new-floor beauty to old worn floors . . . and make floor cleaning easier. Rent a Little American from your nearby dealer, who also furnishes American abrasive-paper and floor finishes for *professional results.*

New Effortless Way to ★ *Dry Clean Rugs*

Dry clean *every* rug in your home in *one* day—with this miracle machine to do all the hard work! It's the American ALM-13 with exclusive new Floating Rug-Brush Attachment for dry cleaning the professional way in your home. Just sprinkle dry-cleaning material on rug . . . guide machine while brush whirls material into rug fibers. Out comes grease, grime, dirt! Pick up with vacuum. Your rug is beautifully clean . . . can be used immediately! Also—use ALM-13 with no-tool attachments for scrubbing, steel wooling, buffing, polishing, waxing *all* floors!

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You'll See More from New Buses

[*Continued from page 154*]

a complete new power plant. Five knock-off fastenings tie in the whole 5,400-pound works, including engines, radiators, drive train and most of the associated gadgetry. Multiple connectors sever all wiring; quick-disconnect fittings break all plumbing. So with spare power units spotted along bus routes, rolling stock needn't be tied up.

Pampering the driver. The idea that it takes a superman to roll a big bus, a notion that drivers don't mind nurturing in the blonde across the aisle, has at least a nubbin of truth. Some coach steering gives quite a workout; most shift levers need frequent attention. On the theory that daisy-fresh drivers are the safest kind, GMC and Greyhound have tried to ease their lot.

Power steering takes over much of the muscle work, and a 30-to-1 over-all ratio saves some wheel-spinning. (If power boost should be lost, the bus can still be handled safely.) Front wheels can be cocked way over, 45 degrees from straight, and the bus has a 45-foot turning radius to cut city corners easily.

For stopping, the driver has an elaborately safetied air-brake system. It can match passenger-car panic stops if the driver wishes to risk piling up the customers in an angry and litigious heap. The emergency hand brake is separate.

Other driver helps include a lavish mirror system that reports how things are to port and starboard; fancy compressed-air wipers, including a special one to clean the windshield by the right-hand mirror; a simplified instrument panel; and a special dolly on the spare tire. Nothing is too good, GMC figures, for a poor guy who might have to change a 304-pound flat tire in front of 43 kibitzers.—*Frank Rowsome Jr.*

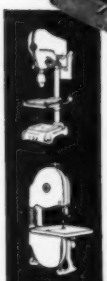
What's in a Name

Father always believed in calling a spade a spade until the day he stumbled over one.—*Wall Street Journal.*

Darra-James POWER TOOLS

Better Than Ever

8" and 9" Tilt Arbor SAWS



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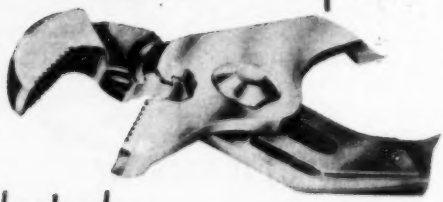
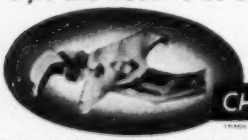


here's why

Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line — you'll find a style and model to do any job better.



CHAN NEL LOCK

THE PLIER DESIGN THAT OBSOLETES ALL OTHERS

CHAMPION DeARMENT TOOL CO. • MEADVILLE, PA.

Sands of Egypt Yield Pharaoh's Ship

[*Continued from page 164*]

Perhaps the tales of the loot are fanciful; there may have been none, if the secret of the builders' escape shaft leaked out and others got in that way first.

At any rate, the King's Chamber has offered scientists no more than a lidless and empty red-granite sarcophagus. Cheops' name, written in red paint among quarry marks on stone blocks, is all of his that they have found anywhere in the Great Pyramid. Seekers have had to look elsewhere for his few relics known until now—a statuette, two rock tablets and several smaller items.

A Treasure House Underfoot?

Now the "royal boathouse," only 25 yards from the Great Pyramid's south face, promises unprecedented finds. Scientists, sight-seers and grave robbers too have walked unsuspectingly over it. But for the construction of a tourist road and a young architect's trained eye, it would still lie hidden beneath 45 feet of sand.

In clearing the sand away, the road-builders recently exposed a 150-yard-long row of 15-ton limestone blocks beneath a walled enclosure. To 34-year-old Kamal el-Malakh, director of works at the site, the blocks looked too massive to be a foundation. Suspecting that they roofed an underground chamber, he had stonecutters pierce one. From the hole came a fragrance of incense and cedar.

Gashing his face against the rock in his haste, and too excited to care, el-Malakh peered in. The sight of the solar boat, by sunlight reflected down with a mirror, took his breath away.

Scientists who have shared a peek are just as excited and jubilant. They call the find the greatest since King "Tut's" treasures in the Twenties, and perhaps even more important. END

Advice to the Lovelorn

A good line is the shortest distance between two dates.—*McCall Spirit.*

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Glazing Compound

- A high quality *white* glazing compound.
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SAVE $15 to $35

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BIG 10 INCH POWER SAW KIT $14.95
BUDGET TERMS

$5 Down
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Why spend $29 to $49 for a power saw when you can easily build one yourself with a few pieces of inexpensive lumber and this kit. You get all machined metal parts *plus* all the screws, nuts, bolts, and washers you need and complete detailed assembly instructions. Make a complete he-man saw that cuts hard or soft woods up to a full 3½ inches thick . . . cuts 2x6s in 2½ seconds. Makes frames, joints, slots, etc. Rips wide or narrow panels, cuts any angle. Cuts joists, siding, rafter. Build and repair furniture and equipment for your home, farm, shop, or office. Table measures 24"x20" and tilts to 45° angle. *Only $14.95 with blade, postage prepaid.* Money back guarantee. Write for complete details.

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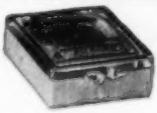

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A Lament for the Model A

[*Continued from page 175*]

gas line, you needed a pair of pliers and 15 seconds. And if you wanted to retime the ignition—for which you may now need an oscilloscope complete with a portable, thick-lensed MIT graduate to twiddle the knobs—you could do an accurate job in less than five minutes. If a Model A needed a carbon-and-valve job, you could button it up in plenty of time before dinner.

No contortions. Partly this was simplicity of design; the engine's fathers didn't have the curious conception that if it's intricate it must be good. But partly it was also because you could get at the engine without 50-inch arms and universal-jointed wrists. It wasn't buried in a deep hole in the chassis, like a watermelon in a well. It wasn't matted over with a jungle of hoses, cables, and tubes, or with power-steering pumps, windshield-washing jars, or relays for blowing the horn. With the A engine, you almost never pulled it from the chassis just to work on it—a current practice that's about as cockeyed as letting a doctor cut open your chest to treat a cold.

There were lots of other good things about the old girl. With a 13-to-1 steering ratio, you could get around a corner without blurring the spokes like a roulette wheel. She'd turn around on a narrow road without making a production of it. Using the manual spark lever, you could readily quench a knock on a hard pull. (The spark was also handy if a dog ran yapping alongside: you retarded the lever, snapped the ignition off and on, and got a wonderfully terrifying backfire.) As for the absence of oil and water gauges, it was widely held that what you didn't know wouldn't hurt you.

And in what other car could you unobtrusively kick off the main gas valve, confronting your girl with a plausible out-of-gas situation on the back road?

The transmission was an unalloyed delight to drivers proud of their shifting skill—there were no sissy synchronizers in that box to hide your mistakes. Down-

[*Continued on page 288*]

NOW! A New, Rugged Portable Jig Saw with a PISTOL GRIP HANDLE!

Provides Cooler Handling, Greater Sawing Accuracy Through Its Easier Operation and Control.

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Does the work of a Rip, Crosscut, Coping, Scroll, Jig, Band and Keyhole saw.

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OUT-PERFORMS ANY SAW IN ITS PRICE CLASS!

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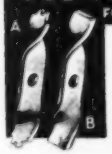

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A Lament for the Model A
[*Continued from page 284*]

shifting without a trace of a clash into second at 25 m.p.h. or low at 10 was entirely practicable. But it took a nice feeling for revs, an instinct for setting the countershaft speed, and some deft double-clutching. When you did it just right, the gears slid together with a silent nicety that separated the men from the boys.

A few flaws. It doesn't make the Model A less of a car to admit that it wasn't perfect. Those brake rods sounded like a Cuban band; the gas tank in your lap wouldn't have been a good companion in a bad smash; and the parking brake could freeze on in winter, giving you a choice of abandoning the car until spring or taking a torch to the drums.

By 1954 tastes the Model A was no fireball. She had just 40 horses to tote some 2,200 pounds, and getaway at 55 pounds to the horsepower didn't exactly snap your head off. The egg beater under the hood had a respectable 200.5-cubic-inch displacement, but it only worked at 4.22-to-1 compression. (This raises the question as to why we bought gasoline—whale oil would probably have done as well.) And while the car was good in its day at road-keeping and cornering, don't slam a surviving model into a rough turn or you'll have a distinct impression of piloting a loose-jointed cowbarn on wheels.

Certainly it's unfair to assess this loyal old car by modern standards. Perhaps it is unreasonable, too, to ask why Detroit doesn't make them any more—it having been repeatedly shown that there isn't a mass U.S. market for dogged, unvarnished transportation, at least from new cars.

But what *is* fair is a prophecy: 26 years from now, in 1980, darn few of us will recall the glistening 1954 models with the same warm affection with which we now remember the Model A. END

Longevity Explained

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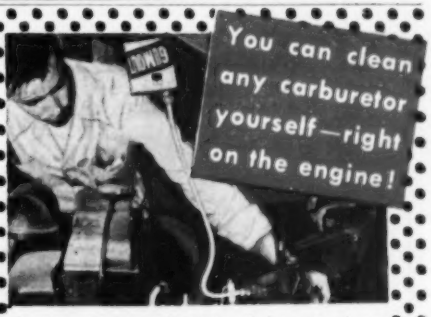

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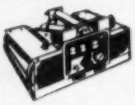

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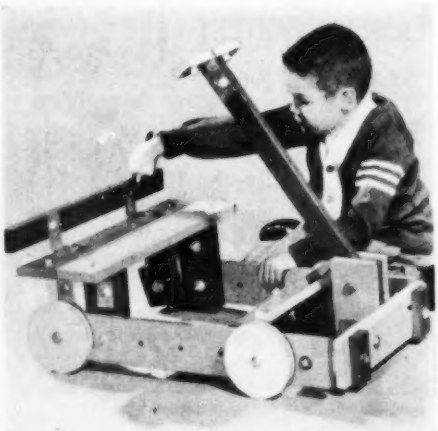

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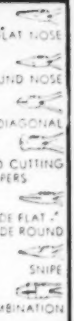

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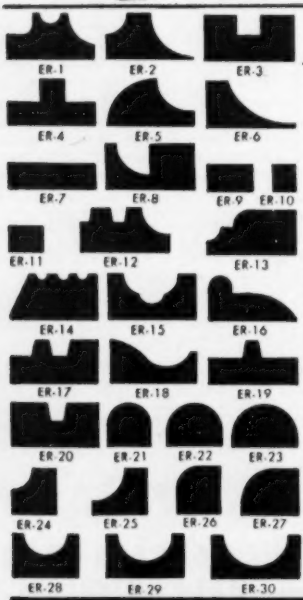

Style	CUTTER DIAMETERS 1¾	2½	3¼
ER-1	9.75	18.60	26.10
ER-2	9.75	18.60	26.10
ER-3	9.70	18.55	26.05
ER-4	9.65	18.50	26.00
ER-5	9.75	18.60	26.10
ER-6	9.50	18.35	25.85
ER-7	6.75	15.60	23.10
ER-8	9.90	18.75	26.25
ER-9	5.25	15.60	21.60
ER-10	4.55	13.40	20.90
ER-11	4.95	13.80	21.30
ER-12	9.75	18.60	26.10
ER-13	9.75	18.60	26.10
ER-14	7.25	16.10	23.60
ER-15	9.90	18.75	26.25
ER-16	9.50	18.35	25.85
ER-17	9.60	18.45	25.95
ER-18	9.75	18.60	26.10
ER-19	9.65	18.50	26.00
ER-20	9.70	18.55	26.05
ER-21	6.25	15.10	22.60
ER-22	6.75	15.60	23.10
ER-23	8.25	17.10	24.60
ER-24	6.75	15.60	23.10
ER-25	8.25	17.10	24.60
ER-26	6.25	15.10	22.60
ER-27	6.75	15.60	23.10
ER-28	7.75	16.60	24.10
ER-29	8.90	17.75	25.25
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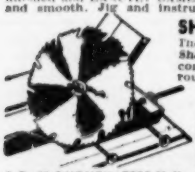

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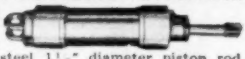

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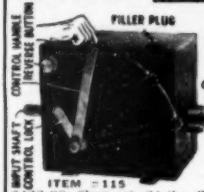

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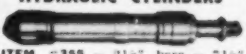

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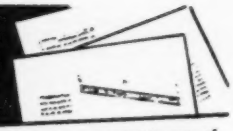

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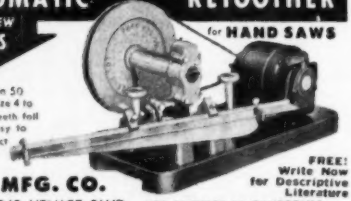

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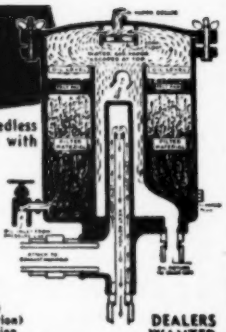

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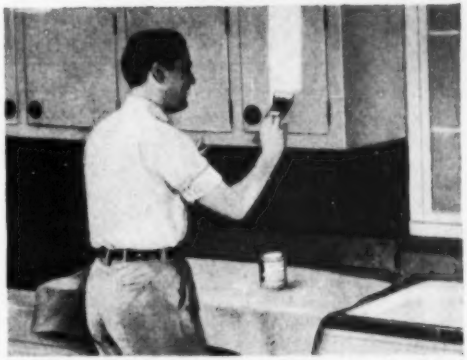

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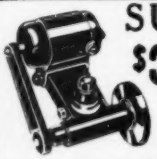

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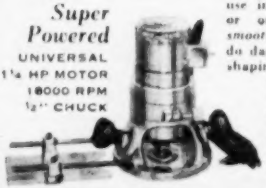

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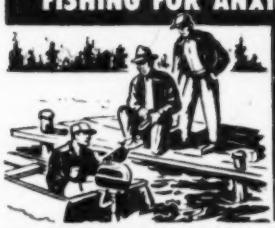

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IMPORTED 7pc. DRAW KIT

Only 3.29

A bargain for the student, draftsman, architect, etc. Has a 4-1/2" divider, a 4-1/2" compass with pen & pencil parts, a 3-1/2" reverse bow compass for pencil and ink, a 4-1/2" ruling pen, capsule of extra leads. All in a velvet lined case.

NEW PLASTIC ELLIPSE SET

A set the artist or draftsman should not be without. Draw perfect ellipses every time. Has projections of 20, 30, 45 and 60 degrees. Ellipses range from 3/8" to 2-3/4" on a major axis. Size: 4½ x 9½". **6.75**

BUILD YOUR OWN DIVING LUNG

Now you can build your own diving lung. Our special folder of instructions completely describes how to do it. Kit includes Air Bottles, Pressure Regulator, Safety Belt, (B-14), Mouth Piece, Shoulder Harness, Clamps, Valves, etc. With 2 bottles (1 hour time limit) . . . **45.95**

$50 VALUE

INCLUDES ALL NECESSARY PARTS

FREE FOLDER — Contains complete details and illustrations of how to build your own diving lung. Also has details of latest Pulley discoveries and developments in Underwater Diving Gear.

Air Corps PRESSURE REGULATOR — Recommended type. Gives you proper regulation of air on demand. **10.95**

COMPRESSED AIR TANK

I.C.C. approved with recent test dates. Will stand pressures up to 1500 P.S.I.

22 cu. ft. cap. (30 minute time limit). No valve. **9.75**

38 cu. ft. cap. (45 minute time limit). No valve. **12.75**

48 cu. ft. cap. (1 hour time limit) No valve. ONLY **17.95**

CONTROL VALVE for above **3.00**

TWO TANK CONNECTOR — Doubles air capacity and diving time. — **4.95**

WEIGHT BELT — With Quick Safety Release. Uses weights below. **1.50**

SLOTTED LEAD WEIGHTS — For use with Belt above. . each . **85¢**

PAL SWIM FINS — New, Top Quality flexible rubber. Tread bottom, adjustable heel strap. Vented for air & drainage. Will float. Sizes: Sm., Med., Large. $7.95 Value. **2.99**

DIVING MASKS — Made of gum rubber. Sturdy glass lens. Adjustable. Small, **99¢** Med., **1.99** Lge **1.99**

DIVING MASK

Makes a DIVING MASKS With 2 built-in Snorkel tubes. Fully covers the mouth & nose. Made of finest material. . . .

Only 10.95

QUICK RELEASE, SAFETY BELT — Can be used as weight belt or for holding knives & other gear. Has quick-release buckle. **2.49**

WEIGHT BELT G.I. SURPLUS — Has individual pockets to permit exact distribution of ballast weights around waist. Each pocket has snap flap. Can use solid weights, pellets, etc. ONLY — **89¢**

150 lb. Test 1/8" dia.

MARLIN HAND FISHLINE Treated, Hard Linen Line. Rot-proof, weather resistant. Not a cord or string. NEW, 300 ft lengths. **1.69**

U.S. AIR CORPS RUBBER BOATS

Just the boat for fishing or fun. Ideal for rivers, lakes or ocean. Made to top Gov't specifications. Re-conditioned & ready.

1 MAN **22.95** 7 MAN **69.95**

5 MAN **59.95**

HY-SCORE .22 CAL. AIR RIFLE — SAVE 8.00

Made in Belgium for Hy-Score. Needs no pumping, just cock and fire. Has ALL STEEL fully rifled barrel, 17½" long. A beautiful natural finished, hardwood stock. Shoots .22 cal. pellets or darts. An excellent training rifle. Ideal for indoor or outdoor use. Length 40½". Weight, 5 lbs. . . . . .

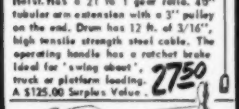
18.00 VALUE **10.95**

TERMS SEE OUR AD ON OPPOSITE PAGE

PALLEY'S DEPT. PS-9, 2263 E. VERNON AVE., LOS ANGELES 58, CALIF.

PORTABLE WINCH HOIST

LIFTS 1500 POUNDS
Made for U.S. Navy Bureau of Ordnance as a Bomb Hoist. Has a 21 to 1 gear ratio. 49" tubular arm extension with a 3" pulley on the end. Drum has 12 ft. of 3/16", high tensile strength steel cable. The operating handle has a ratchet brake. Ideal for 'swing about', truck or platform loading. A $125.00 Surplus Value . . . **27.50**



2500 lb LIFT HOIST 29.50 WITHOUT MOUNT
$210 VALUE

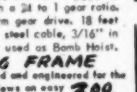
We've sold hundreds of these to garages, machine shops, truckers, boat yards and boat owners, etc. Has a 2500 lb. capacity through a 24 to 1 gear ratio. Had bronze worm gear drive. 18 feet of high tensile, steel cable, 3/16" in diam. Originally used as Bomb Hoist.

MOUNTING FRAME
Specially designed and engineered for the above winch. Allows an easy universal mount. Frame ONLY **3.00**

RIGHT ANGLE DRIVE

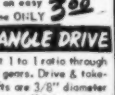
Has direct 1 to 1 ratio through 90° bevel gears. Drive & take-off shafts are 3/8" diameter. Gears are self-lubricating, hi-speed steel. Ideal for use on power tools, flex drives, etc. Size 3½"x 2½"x 1½". **2.25**

180° OFFSET DRIVE



For use where tremendous power at low take-off RPM is desired. Drives through a chain of 6 gears, rotating on self-lubricating, hi-speed roller bearings. Has an 85 to 1 gear ratio. Take-off shafts are 1½" and 3/8" diameter. USED **6.75**

GEAR BOX



The popular 'T' drive. Output shafts are at right angles to input shaft. Ratio is 1 to 1. Shafts are 3/4" dia., & are full bearing mounted. Has 3¾" sq., flange mount. **4.95**

GEAR BOX

Angle drive type with 1 input and 2 output shafts. Output shafts have universal joint fitting. Input dia., 1½". Gear ratio is 1 to 1. Full bearing mounted. Overall size: 10"x 6" x 4". Mounts with 4, ½ x 4" bolts. **5.95**

6 PC. TUBE BENDER SET

For bending copper, aluminum and other thin wall tubing by hand. Of special spring wire coil. Cadmium plated. Set includes sizes for 1/4", 5/16", 3/8", 7/16", 1/2" and 5/8" tubing. A $5.00 value **2.49**

ARMY FIELD PHONES

A private phone or intercom system. Easy to operate. Ideal for use on farms, target range, mountains or forest or any place portable two-way communication is desired. Gives clear reception up to 15 miles. Uses two standard batteries. Set contains ringing generator, leather carrying case and one phone. Several of these phones may be used on one line. Reconditioned and checked out. Price per each phone – only **14.95**
Price for a system – two sets . . . **29.50**

DO IT YOURSELF!
IT'S FUN! IT'S PROFITABLE

SAVE AT LEAST 85% TAX FREE!!
REMEMBER – – A Dollar Saved is Worth More Than TWO Dollars Earned – because you pay no Income Tax on what you SAVE when you BUY for LESS . . Income Tax is not collectable on what YOU DO FOR YOURSELF – Nor do you pay the hidden tax on someone else's labor savings!!

JOIN THE PARADE!
NOW – for the FIRST TIME – You can Buy Direct from the IMPORTER

SAVE 50% on LUMBER ALONE

GENUINE PHILLIPINE SELECT MAHOGANY PLYWOOD
AT LESS THAN WHOLESALE PRICES

Purchased and shipped DIRECT to us in BOAT LOAD LOTS by our overseas offices, we obtain HUGE SAVINGS which we are passing on to YOU. This sensational Mahogany Plywood promotion has taken California by storm and now, after months of careful preparation, we are ready to serve the NATIONAL "DO-IT-YOURSELF" movement.

YOU'LL BE FASCINATED By the Beauty, Warmth & Strength of this lovely LUAN MAHOGANY PLYWOOD. Its Rich, Golden elegance will enthral you and you will find upon comparison with your local lumberyard that our special prices on this very beautiful plywood is less than that which most common woods are now being sold for.

This selected LUAN MAHOGANY Plywood is WEATHER and WATER RESISTANT. Bonded with the finest Urea Formaldehyde Resin Adhesive. Rotary cut for beauty of grain with both sides sanded and ready for use. Face side is unjointed. Ideal for panneling dens, offices, hotels, theatres, etc. Also ideal for the finest cabinet work, furniture, etc. Comes in 2 panel sizes: 4ft. x 8ft. x 1/4" and 3ft. x 6 ft. x 3mm (approx. 1/8") thick. Order TODAY and SAVE!

3ft. x 6 ft. x 3 mm approx. 1/8" — 18 sq. ft. — A $5.00 VALUE — **1.79** FULL SHEET — Min. Order – 8 Sheets

Through special arrangement with national freight truck lines we have established special LOW SHIPPING RATES to any part of the country for lots of 100 lbs. or more. (4) 1/4" or (8) 1/8" panels weigh approximately 100 pounds. We cannot accept orders for less than 100 pounds.

4ft. x 8 ft. x 1/4" — 32 sq. ft. — A $9.50 VALUE — **4.49** FULL SHEET — Min. Order – 4 Sheets

DO-IT-YOURSELF LAWN SPRINKLER SYSTEM

$49.00 Value

Install your own. All you need is a knife or saw, a spade and the special plastic cement included with each order. System has plastic flexible pipes and will go around the trees, under walks, etc. Dig no trench, thread no pipes – just slit ground with spade, slip pipe in, press sod back attach to water supply and your ready to go. The system includes 100 ft. of Eastman Kodak 'TEMITE' plastic pipe – guaranteed for 25 years against rust, rot, corrosion, etc. Also 10 solid Brass adjustable sprinkler heads, all necessary fittings, cement and instructions for use. **29.95**

WORLD FAMOUS PRECISION MADE TELESPECS

Manufactured by finest European Optical experts. Lightweight (1 oz.), Compact – Durable. Ideal for viewing Sports, Plays, Birds, etc. Have individual eye focus, clear, sharp vision, powerful magnification and a wide field of view. Leaves both hands free. Exceptional value. . . **1.49**

100-200-300 POWER MICROSCOPE

Has triple revolving lens turret with 100-200-300 power lenses. An all-metal, inclinable body. Fully ground and polished achromatic lenses. Plane substage mirror. In a dovetailed hardwood case. Ideal for home lab, student, etc. We challenge you to compare. **9.49**

NEW SURPLUS WADING SUIT

Back in stock AGAIN! Will make surf and deep stream fishing a real pleasure. Ideal for use wherever it is necessary to protect the body or clothes from muck, moisture, silt, etc. Made to finest Gov't specifications. Originally used as an Overboard suit in landing operations. Made of heavy duty rubberized canvas. Has vulcanized seams and built-in rubber gloves & boots. **10.95**

AMAZING DO-IT-YOURSELF CATALOG

SAVINGS UP TO 85%
320 PAGES — FULLY ILLUSTRATED

Palley's "Gadgeteer's Heaven," the Pioneer in DO-IT-YOURSELF offers you this Bargain filled catalog. Contains thousands of Bargains in GOV'T SURPLUS — FACTORY CLOSEOUTS and GENERAL MERCHANDISE!
Includes World's LARGEST stock of Hydraulic parts – from a complete hydraulic system to 20,000 cylinders, in 61 sizes and types. Also thousands of items in Hand & Power Tools, Gadgeteers & Hobbyist items of all types, Foam Rubber and how-to-do-it, Cameras and Photo Supplies, Precision Instruments, Microscopes, Outdoor & Sports Equipment, Binoculars, etc.

SEND 50¢ to cover cost of Handling and Mailing – 50c credited to your FIRST order!

Order YOURS TODAY!

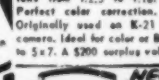
PALLEY SUPPLY CO 2263 E. VERNON AVE. DEPT. PS-9 LOS ANGELES 58, CALIF.

Order from This Ad. Pay by M.O. or check. P.O.'s accptd. from D&B firms (1) deposit with C.O.D.'s. All Prices FOB Los Angeles.

7" - f2.5 CAMERA LENS

Eastman Aero Ektar, f:2.5 lens with 7" focal length. Has diaphragm markings on lens from f:2.5 to f:16. Perfect color correction. Originally used on K-21 aerial camera. Ideal for color or B&W up to 5x7. A $200 surplus value. **69.50**

NEW GEIGER COUNTER 55.50



FIND URANIUM

New 'strikes' are bringing fortunes! Why wait? Get started today with this Searchmaster Geiger Counter. Sensitive Beta, Gamma, Cosmic & X-Rays. Free Copy of 128 page book by A.E.C. and U.S. Geological Survey with each order. Tells how to operate and identify ores.

EXTRA FINE WIRE CLOTH SCREEN

A Super Fine Quality at Less Than the Mfg's Cost. Only Gov't Surplus could offer you this value! Ideal for fine strainer work. Absolutely insect proof.

BRONZE CLOTH SCREEN – 32 Mesh – .007 Gauge – 42" Wide. (Minimum Order 10 lineal feet) – Per lineal ft. (3½ sq. ft) 65¢ ft. Vol. 29¢ FT. Price per roll (100 lineal feet) – **23.50**

MONEL CLOTH SCREEN – (Nickel-Copper Alloy) – 36" wide – 63 Mesh .0045 Gauge – Minimum 10 lineal feet. Per lineal ft. (3 sq. ft) 90¢ ft. Vol. 39¢ FT. Price per roll (100 lineal feet) – **33.50**

NEW DEPTH GAUGE

Depth Gauge and Protractor. Made of finest quality steel. Has double-face, 6" scale in 32's and 64's. Thumbscrew lock on head. Increments & numbers engraved. Millers-Falls tool. **1.89** 49¢ MAIL

NEW CASTER SET

Made to Government specs by Bassick. Has 1-5/8" dia., hard rubber wheel. Bright metal frame and stem. Rotates on ball bearings. Ideal for home, shop, office, etc. Set of FOUR . . . **1.49**
$4.00 Value

PORTABLE SHOVEL

Ideal for Camper, Gardener, Farm etc. Has 28" wood handle. Blade folds at right angle to use as a pick. Good emergency shovel to carry in car. **1.29**

10 PC. HOBBY MIX

A set for hobbyist, model maker, etc. Consists of (1) Bistouri Scalpel Knife, 3pc. Offset Scriber, (1) Jewelers Hammer, (1) Inspection Mirror, (1) Hemostat & 5 assorted Shaping Tools. A 10 piece set. . . **4.49**

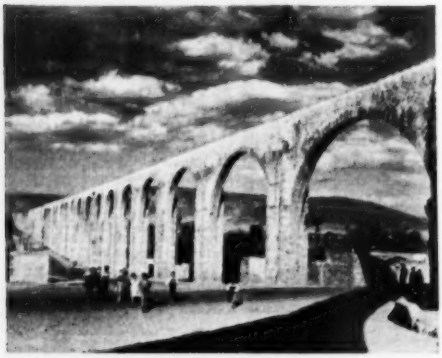
How Much Did You Learn?

By Stanford E. Taylor and Helen Frackenpohl
Washington Square Reading Center, New York

Now you can sample how much you remember of the useful and interesting information packed into this issue of POPULAR SCIENCE MONTHLY. Answers to the questions are printed just below the quiz. After each answer is a page reference to the article on which the question was based.

1. Compared with standard railroad coaches, Talgo-train cars are:
a. less than ⅓ the length
b. less than ½ the length
c. less than ¾ the length

2. You might enjoy this picturesque scene while driving through



a. Spain
b. Florida
c. Mexico

3. Model A's had it over newer cars in
a. fast pickup
b. low running temperature
c. simple ignition system

4. One advantage of the new glass heating panels is their
a. low cost
b. indestructibility
c. safe surfaces

5. Visitors now enter the Great Pyramid of Cheops through an opening in its side made by
a. Cheops' workmen
b. grave robbers
c. modern archaeologists

6. You should modernize your power supply if, of the total current needed, your service is less than
a. 30 percent
b. 40 percent
c. 50 percent

7. While standing on your head, you can see better
a. the color around you
b. darks and lights
c. objects and forms

8. Homeowners will welcome B-27 bluegrass because it is
a. a vigorous, spreading grass
b. unusually inexpensive
c. slow growing

9. To build each of the expressive puppets you see on TV's "Morning Show" takes Bil Baird about
a. 50 hours
b. 100 hours
c. 250 hours

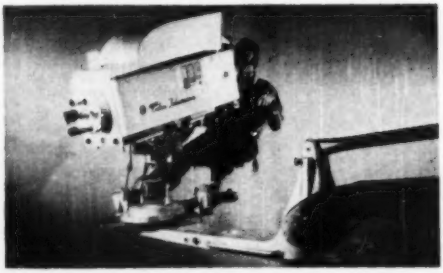
10. TT railroad fans prefer their gauge to others because
a. more kits are available
b. there is more chance for original models
c. less power is required for operation

Answers: 1. b—p. 188; 2. c—p. 146; 3. c—p. 172; 4. c—p. 107; 5. b—p. 160; 6. b—p. 137; 7. a—p. 213; 8. a—p. 167; 9. c—p. 139; 10. b—p. 180.

NEXT MONTH . . .

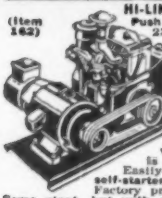
How They "Paint" TV Color Pictures

A new kind of painter is creating the brilliant spectacles you can see on color TV this fall. He uses, instead of brushes, an intricate battery of spotlights. The October issue of PSM will tell you his secrets and show you the results in exciting full-color photographs.



TERRIFIC VALUES

HI-LINE 6000 WATT PLANT



(Item 162) **Push Button Start** 115-230 v. 60 cyc. A.C. A brute of a power plant with a rugged 14 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995. With self-starter. Factory price **$645.00**

Same plant, but with crank start, $585.50
Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price **$345.00**

HI-FLO Centrifugal PUMP

Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. ! . . Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Pre-lubricated sealed bearings for years of heavy service.

Big 1½" Model. Item 502. Wt. 70 lbs. **$134.50**
2" Model (150 gal. per min.) with 2½ HP engine. Item 502a. Wt. 90 lbs. **$154.50**

52 pc. SOCKET SET

Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in ½" drive, ¾" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job; in a big doghouse steel box. Wt. 17 lbs. (Item 205) List price $62.90. Factory special . . **$27.95**

9 TON HYDRAULIC PRESS

A tremendously powerful hydraulic press, capable of exerting 18,000 lbs. pressure. Pays for itself many times over—straightening bent connecting rods, king pins, crankshafts, axles, link pins and bars — or pushing out frozen bearings and bushings. Developed pressure under precise control and visible at all times on accurate gauge. Complete with both large and small anvils and jigs to straighten any kind of curve or bend. (Item 464) Wt. 110 lb. Actual list price $365. Our special close-out price... **$69.50**

HEAVY DUTY D-C ARC WELDER

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to 5/16" plate using ¼" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and triple V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. $400 value at **$99.75**

with mounting flange (Item 38)

DUAL CONTROL MODEL, same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Special..... **$119.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.. **$10.50**

at MASTER MECHANIC'S Direct from Factory Prices

PORTABLE LIGHT PLANTS

Ideal for your camp, cottage, trailer or boat!

(Item 24)

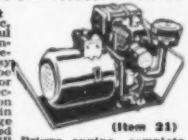
600-700 WATTS PUSH BUTTON START 115 v. 60 cyc. AC Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary! Just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense and Fire Dept. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. $275 value..... **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output..... **$199.50**

1500-1700 Watt Plant (Item 20) similar to Item 24, but has three times more capacity. Wt. 173 lbs. Factory price... **$279.50**

LITTLE GIANT—350 WATT (Item 273) 115 v. DC 1½ hp. Briggs engine. Perfect for lights, radios, small power tools. Wt. 65 lbs. Factory price..... **$99.75**

MASTER-LITE 2500 Watt Plant 110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price $645.00 (Item 21) Factory Price..... **$329.50**



(Item 21)

3000-3500 Watt Plant (Item 23) 115 v. 60 cyc. AC. **Push Button Start.** Direct Drive. Wt. 270 lb. Factory Price..... **$379.50**

We make fully automatic controls to operate any of the above light plants. Write for details. We make all sizes up to 25,000 Watts.

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor. 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. 200 to 600 CFM).

8" Fan, wt. 5 lb. **$6.85**
9" Fan, wt. 6 lb. **$7.85**
10" Fan, wt. 7 lb. **$8.85**
12" Fan, wt. 8 lb. **$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E) **$71.95**
12" Fan, wt. 10 lbs. (Item 10D) ... **$12.95**

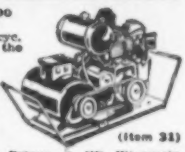
CONDITIONAIRE VENTILATING FANS

Save big money installing your own exhaust fan. Efficient propellor type blade moves huge volume of air quietly and effortlessly. Heavy welded frame — pre-drilled for easy installation. Just cut opening and bolt in place. **Continuous duty** motors. Ideal for attics, restaurants, garages, barns, chicken houses, etc. Control manually or with thermostat.

Blade	Opening	CFM	Wt.	Item	
16"	18¼"	2925	19 lb.	365a	$27.95
18"	19¼"	3600	27 lb.	365b	$31.95
20"	21¼"	4100	30 lb.	365c	$39.95

SAVE UP TO 85%

GIANT 2000-2500 WATT PLANT



(Item 31)

110-120 v. 60 cyc. AC. absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs 6 HP Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price $585. Special at..... **$299.50**
Same plant with electric self starter (Item 31a)..... **$359.50**
Generator only and control box... $169.50
DUAL VOLTAGE 110-220 available on any of above models for $28.00 additional.

EXTENSION CORD

Very flexible and tough; Neoprene 2 16-2 conductor cord, ideal for lawn mowers, hedge trimmers and power tools. U.L. approved. Complete with heavy rubber plug and outlet. 40 ft. cord (Item 17a) Wt. 2½ lbs. regularly $4.95—SPECIAL.. **$2.95**
100 ft. combination (2-40 ft. and 1-20 ft.) Item 17N. factory price.... **$6.45**
NEOPRENE CABLE 2 14-2 (Item 185) Heavy duty, very flexible, 20 year quality. Wt. 9 lbs. 100 ft. Complete with rubber plug and outlet. *A terrific buy at only*..... **$8.95**
NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs. **$6.95.** 100 ft. (Item 200)..... **$12.95**

JET STEAM MASTER

Now, a new super-efficient portable steam generator that provides live steam at 100 lbs. pressure in 60 seconds from a cold start! The first quality steam blaster ever offered at this low price. Instantly cleans sticky grease, dirt, rust, old paint, etc. off motors—farm implements and road machinery. Pays for itself in a few weeks. Sterilizes as it cleans — milk equipment, etc. Fully automatic—oil fired with built-in water circulating pump. Draws water from faucet or bucket. Simple and safe; anyone can use it—built-in safety valve. New triple efficiency jet steam gun automatically mixes in soap and detergent if desired. Wt. 250 lbs. Item 463.
Special factory price..... **$298.00**

CONDITIONAIRE ATTIC FANS

Now, at new low cost, you can relax . . . live and sleep in cool comfort. Master Mechanic's attic fans exhaust stale, hot humid air . . . pull in fresh cool air. High contour blade design and venturi shaped frame move large volume of air—cool the entire house in a few minutes at quiet low speed. Dynamically balanced blade, rubber mounted shaft and motor, assure smooth quiet operation. Pre-drilled frame is easily mounted in a few minutes, just cut opening and bolt in place. Complete with heavy duty ¼ or ½ hp. electric motor. Conditionaire fans are built in our factory—you buy them at low factory prices.

Blade	Opening	Rooms	Wt.	Item	Price
24"	28 x 28	5	75 lb.	555	$66.50
30"	34 x 34	7	90 lb.	555a	$74.50
36"	40 x 40	9	105 lb.	555b	$82.50
42"	46 x 46	11	150 lb.	555c	$93.50

Add $6.00 to above prices for horizontal mounting.

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for... BIG 1954 Catalog

MASTER MECHANIC MFG. CO., DEPT. 59H **Burlington, Wis.**

NEW! Giant **AUTOMOTIVE CATALOG**

1954 Edition! Everything for car, truck, custom-styled car, hot rod . . . at LOWEST PRICES!

Save up to 50% on all parts, accessories! Only complete automotive buying guide...50,000 items ...148 pages! Thousands of **hard-to-find parts;** equipment, parts for 1929 to 1954 models; **Hollywood accessories** never before offered; **hi-speed parts.** Send your name and address and 25c (refundable with first $5.00 order) to:

J. C. Whitney & Co., 1917 Archer, Dept. T-9, Chicago 16, Ill.

SAVE $65 ON THIS $100 CONTOUR CHAIR

- Goodyear Air Foam Cushioning
- Duran Upholstery
- Easy to assemble—hammer, screwdriver only.
- Green, Gray, Red, Brown
- Money back Guarantee

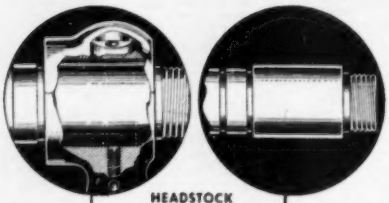
Everything needed to put together in one eve.

Complete Kit Only **$34.95**

ORDER NOW
$5 deposit. Balance C.O.D. Or write for literature.

BESTECRAFT CO. Dept. 77
Mathieson Bldg.; Baltimore 2, Md.

SOUTH BEND 9" LATHES



HEADSTOCK

Bearings are line bored and bearingized for precision fit. Ample lubrication from oil reservoirs. Spindle is carburized, hardened, and ground; with bearing surfaces super-finished to .000005" rms.

BELT RELEASE

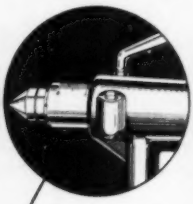
Instant release of belt tension for speed changes. Proper tension of headstock spindle drive belt is easily adjusted.

TAILSTOCK

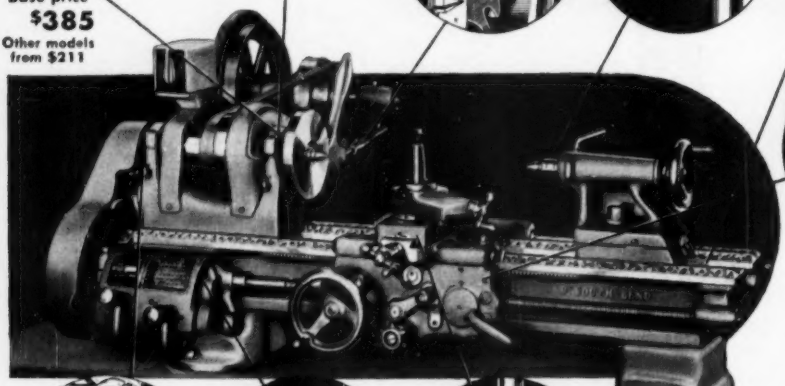
Has set-over for taper turning. Graduated spindle has witness mark for aligning cutter bit. Hardened center self-ejecting.

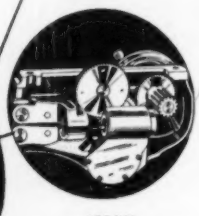
BED

Three V-ways and one flat-way are hand-scraped entire length for precision alignment of headstock, tailstock, and carriage.



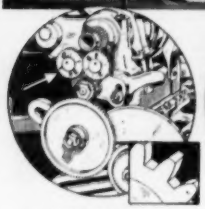
Base price
$385
Other models from $211





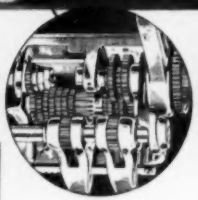
APRON

Has powerful friction clutch and large half-nuts. Safety interlock prevents engaging opposing feeds. All gears machine cut.



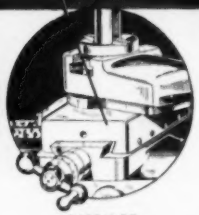
REVERSE GEARS

Easily shifted for reversing lead screw rotation and feeds, positive lock. All the gears used in this lathe are machine cut.



GEAR BOX

Screw threads and power feeds selected by shifting two tumblers as indicated on index chart. All gears machine cut steel.



CARRIAGE

V-ways and dovetails hand-scraped. Engine divided micrometer collars on feed screws. Compound Rest base graduated 180 degrees.

Send for this *New Catalog*

56 pages showing the complete line of South Bend Machine Tools. Mailed on request to any address.

• • • •

Time Payment Terms

You can purchase any South Bend Machine Tool complete with attachments and accessories, paying as little as 10% down and balance in 12 or 18 monthly payments. Write for information.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941

Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ TOOL GRINDERS ☐ ½" & 1" Collet TURRET LATHES ☐ 7" BENCH SHAPERS

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City _____ State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

I'll Train You AT HOME in Spare Time for Good Jobs in RADIO-TELEVISION

America's Fast-Growing Industry Offers You

1. EXTRA MONEY IN SPARE TIME

Keep your job while training at home. Many NRI students make $10, $15 a week extra fixing neighbors' sets in spare time, starting soon after enrolling. The day you enroll I start sending you special booklets that show you how to fix sets. You use the Multitester built with equipment I furnish to locate and correct set troubles. Adam Kramlik, Jr., Sumneytown, Pa., wrote: "Earned $12 to $15 a week, spare time. Now have my own Radio-TV shop."

2. GOOD PAY JOB

Radio-Television growth and expansion and new uses for known principles are making more jobs for well-trained men. There are over 3000 Radio Broadcasting Stations on the air giving good pay to operators, technicians. Over 115 million home and auto Radios are now in use, providing full time and spare time servicing opportunities. Government, Aviation, Police, Ship, Micro-wave Relay, Two-way Radio Communications for buses, taxis, trucks, railroads are growing fields of opportunity.

3. BRIGHT FUTURE

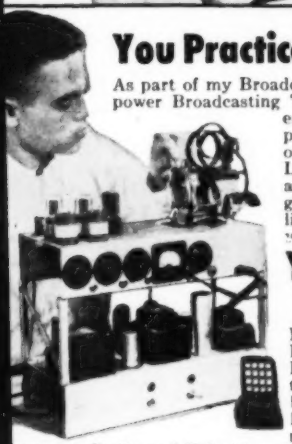
About 200 Television stations are now on the air from coast-to-coast. Hundreds more being built and hundreds of others authorized. These new stations will need operators, technicians. More than 25 million Television sets are already in use and require servicing. Thousands more Television sets are being sold every week and need installation, servicing. Act now to qualify for a good job or your own sales and service business. Cash in on this rapid growth.

Television is Making Good Jobs, Prosperity

Training plus opportunity is the PERFECT COMBINATION for job security, advancement. When times are good, the trained man makes the BETTER PAY, gets PROMOTED. When jobs are scarce, the trained man enjoys GREATER SECURITY. NRI training can help assure you and your family more of the better things of life. My training is practical, complete; is backed by 40 years of success training men at home. My well illustrated lessons give you basic principles you need and my skillfully developed kits of parts "bring to life" things you learn from the lessons.

Find Out What Radio-Television Offer You

Without obligating you in any way, I'll send an Actual Lesson to prove that training at home is practical. I'll send my 64-page book to show good job opportunities for you in Radio-Television, show equipment you build, show what my graduates are doing and earning. Terms for NRI training are as low as $5 a month. Many graduates make more in two weeks than the total cost of my training. Mail coupon now. J. E. SMITH, President, National Radio Institute. Dept. 4JB, Washington 9, D. C. OUR 40TH YEAR.



You Practice Broadcasting with Parts I Send

As part of my Broadcasting Course I send you kits of parts to build the low-power Broadcasting Transmitter shown at left. You use it to get practical experience putting a station "on the air," performing procedures demanded of broadcasting station operators. An FCC Commercial Operator's License can be your ticket to a better job and a bright future. My Communications Course gives you the training you need to get your license. Mail card and see in my book other valuable equipment you build.

You Practice Servicing with Parts I Send

Nothing takes the place of PRACTICAL EXPERIENCE. That's why NRI training is based on LEARNING BY DOING. You use parts I furnish to build many circuits mmon to Radio and Television. With my Servicing Course u build the modern Radio shown at right. You build a Multi-ter which you use to help fix sets while training. Many stu-nts make $10, $15 a week extra fixing sets in spare time, rting a few months after enrolling. All equipment I send is urs to keep. Mail postage-free card for Actual Lesson and Book.

The Tested Way to Better Pay

I TRAINED THESE MEN AT HOME FOR SUCCESS IN RADIO-TELEVISION

New Has Own Shop. "Got laid off my machine shop job which was best thing that ever happened to me as I opened a full time Radio shop."—Ernest T. Slate, Corsicana, Texas.

Good Job with Station. "I am broadcasting engineer at WLPM. Another technician and I have opened a Radio-TV service shop in our spare time."—J. H. Bangley, Jr., Suffolk, Va.

First Job Thru NRI. "My first job was operator with KDLR obtained for me by your Graduate Service Dept. Now charge of Radio Equipment for Police and Fire Dept."—T. S. Norton, Hamilton, Ohio.

Paid for Course in Spare Time. "By the time I graduated I had paid for my course, a car and testing equipment essential to Radio Servicing." — E. J. Streitenberger, New Boston, Ohio.

AVAILABLE TO VETERANS under G.I. BILLS

Want Your Own Business?

Many NRI trained men start their own business with capital earned in spare time. Let me show you how you can be your own boss. Joe Travers, a graduate of mine, in Asbury Park, N. J. writes: "I've come a long way in Radio and Television since graduating. Have my own business on Main Street."

CUT OUT ON DOTTED LINE

Mail this Card to Get 2 BOOKS FREE

The ABC's of SERVICING

ACTUAL LESSON

This card entitles you to actual lesson on Servicing. It will convince you that learning Radio-Television at home is easy, practical.

64 Pg. BOOK

MY DOUBLE OFFER also includes 64-page Book, "How to Be a Success in Radio-Television." You'll see what my graduates are doing, earning; see photos of equipment I send.

NO STAMP NECESSARY

MR. J. E. SMITH, President, Dept. 4JB,
National Radio Institute, Washington 9, D. C.

Mail me Sample Lesson and 64-page Book, "How to Be a Success in Radio-Television"—Both FREE. (No salesman will call. Please write plainly.)

NAME ..... AGE .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

VETS write in date of discharge .....

SEE OTHER SIDE

Be a Success as a RADIO-TELEVISION Technician

See Inside

NRI Training Can Lead to Jobs Like These in Radio-Television

BROADCASTING: Chief Technician, Chief Operator, Power Monitor, Recording Operator, Remote Control Operator. SERVICING: Home and Auto Radios, P.A. Systems, Television Receivers, Electronic Controls. FM Radios. IN RADIO PLANTS: Design Assistant, Service Manager, Tester, Serviceman. SHIP AND HARBOR RADIO: Chief Operator, Radiotelephone Operator. GOVERNMENT RADIO: Operator in Army, Navy, Marine Corps, Forestry Service Dispatcher. AVIATION RADIO: Transmitter Technician, Receiver Technician.

Read What NRI Graduates Say

Handles Only Tough Jobs "Am employed as Technician for Television Clinic. Handle only tough jobs. NRI started me off on the right foot." —Bernard Siers, Cleveland, Ohio.

$10 to $15 Week Spare Time. "Four months after enrolling, was able to service radios—averaged $10 to $15 week spare time. Now have full time business." — Wm. Weyde, Brooklyn, N. Y.

Works on TV Color. "My position with WNBT is video control engineer. I owe a lot of my success to your textbooks."—Warren Deem, Malverne, N. Y.

Has Growing Business. "Am becoming an expert Teletrician as well as Radiotrician. Without your practical course this would have been impossible." — Philip G. Brogan, Louisville, Ky.

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(Sec. 34.9, P.L.&R.)

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How MILD can a cigarette be?

These CAMEL smokers have known for 35-40 years!

When you've enjoyed Camels for 30 years or 30 days . . . you know why they're now more than ever America's most popular cigarette!

JOHN W. FINCHER, Cairo, Ga. "For 35 years, I've gotten more pleasure out of Camels than any other brand!"

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W. C. FOWLER, Dallas, Tex. "Forty years I've enjoyed Camels. They suit my taste—agree with me best!"

MRS. KATHARINE B. COELSCH, The Dalles, Ore. "Camels were my choice 35 years ago. They're really mild!"

MRS. B. COLLINS EDGAR, Lookout Mountain, Tenn. "I've enjoyed Camels' mild smoothness for 35 years!"

From the great Camel file of unsolicited letters from Camel smokers.

R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

Evelyn Terjesen, N. Y. City, Secretary

Make your own 30-day Camel Mildness Test!

Yes, try Camels *yourself!* Make the famed 30-day Camel mildness test. See what you've been missing in true mildness, richer flavor and more pure pleasure!

For Mildness, For Flavor...

CAMELS AGREE WITH MORE PEOPLE THAN ANY OTHER CIGARETTE